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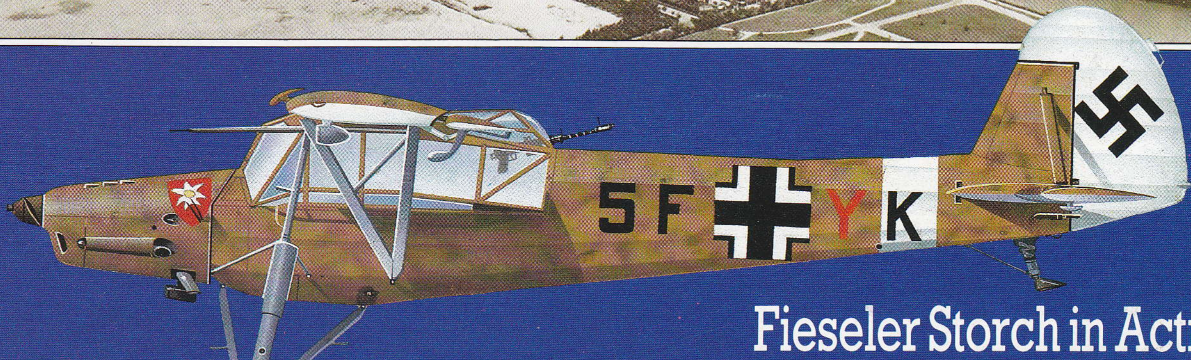
Westland Lysander in Action



Fieseler Storch in Action

Army Co-operation

Armed Forces of the World: Portugal

A fully illustrated guide to Light Aircraft of World War II

WAR MACHINE

Volume 11 **Issue 130**

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Light Aircraft of World War II

Seen here flying over the Suez canal, the Westland Lysander failed in its primary role as an army co-operation aircraft, as the Germans enjoyed air superiority over France in 1940. It was later used on covert missions to occupied Europe.

Light aircraft were used for all manner of tasks in World War II, from everyday missions like artillery spotting and general liaison duties to clandestine flights behind the lines, carrying agents. Aircraft like the Lysander and the ubiquitous Fieseler Storch performed valuable work throughout the war.

Use of light aircraft by the warring nations of World War II for operational purposes (as distinct from training tasks) was widespread and covered a host of duties. Reasons for their choice were equally diverse, ranging from ready availability, via low-cost production, operation and performance suitable for a specific task, to simplicity of training and flying.

In general terms the category of 'light aircraft' may be said to include those whose normal loaded weight was below about 2750 kg (6,060 lb), although in most instances the true light aircraft of World War II took off at a third of this weight. At one end of the scale the UK's Westland Lysander was a relatively large aeroplane but qualified for inclusion in the category on account of its outstanding agility, short field performance and slow-speed capability, attributes which should have rendered it ideal for that nebulous duty undertaken by the RAF during the first half of the war: army co-operation.

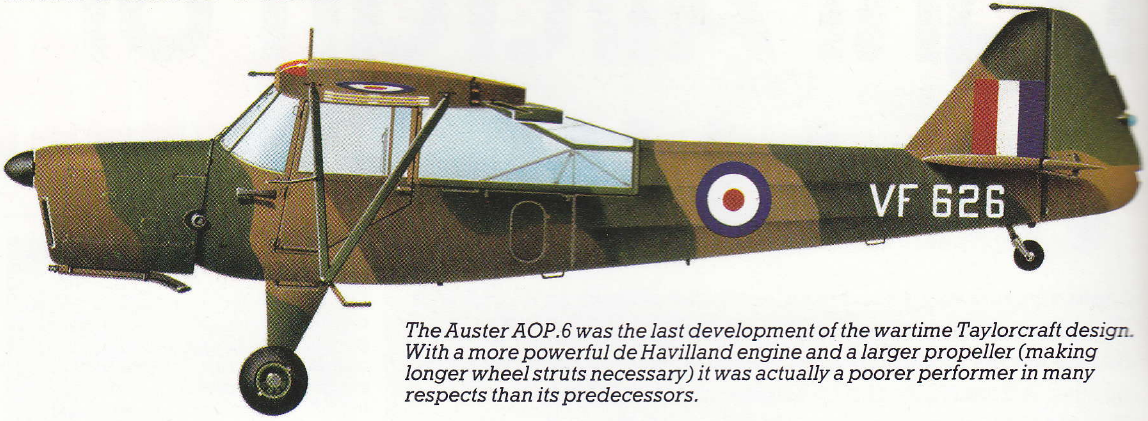
When it was discovered that the Lysander (and the German Henschel Hs 126) fell short of the requirements which the true ground support role demanded, for the harsh battle conditions of *Blitzkrieg* had never been countenanced, the whole gamut of air operations over the battlefield changed: the true army co-operation duties (in particular artillery observation) were undertaken by genuine lightplanes (the Austers and 'Grasshoppers') while ground support moved up the scale to embrace the capabilities of the high performance fighter-bomber.

For duties involving covert operations, such as transport of agents, rescue of shot-down airmen from enemy territory and other duties involving use of remote or confined sites, the lightplane was the obvious remedy, and of all the aircraft employed in these tasks none better than the Fieseler Storch was ever produced: its agility became and remained forever legendary, even after the helicopter had become an accepted component of the world's arsenals.

The 'Grasshopper Fleet' of liaison and light observation aircraft was vital to the war effort, but were essentially barely modified civilian light plane designs. These Piper L-4s are seen in an English field prior to delivery to the front in 1944.

UK

British Taylorcraft Auster series


The Auster AOP.6 was the last development of the wartime Taylorcraft design. With a more powerful de Havilland engine and a larger propeller (making longer wheel struts necessary) it was actually a poorer performer in many respects than its predecessors.

In 1936 the Taylorcraft Aviation Company was formed in the USA to design and manufacture lightplanes for private use. Most successful of the prewar aircraft to emanate from this company were designated Models B, C, and D, and in November 1938 Taylorcraft Aeroplanes (England) Ltd was established at Thurmaston, Leicestershire, to build these aircraft under licence.

Six American-built Model As were imported into the UK, followed by one Model B. Of braced high-wing monoplane configuration, with a fabric-covered wing of composite wood and metal construction, the aircraft featured a fuselage and tail unit both of welded steel tube with fabric covering. Accommodation within the enclosed cabin was for two persons, seated side by side, and landing gear was of basic non-retractable tailwheel type, with main unit shock-absorption by rubber bungee. Powerplant of the imported Model As consisted of one 30-kW (40-hp) Continental A-40 flat-four engine.

The British-built equivalent to the Model A was designated the **British Taylorcraft Model C**, but this was soon redesignated **Plus C**, reflecting the improved performance resulting from installation of a 41-kW (55-hp) Lycoming O-145-A2 engine.

Other than provision of split trailing-edge flaps to improve short-field performance, the aircraft of the Plus-C derived **British Taylorcraft Auster** series were to change little throughout the war. During this time more than 1,600 were built for service use, the **Auster Mk I** entering service with No. 654 Squadron in August 1942.

At the height of their utilization, Austers equipped Nos 652, 653, 657, 658, 659, 660, 661, 662, 664 and 665 Squadrons of the 2nd Tactical Air Force, and Nos 651, 654, 655, 656, 663, 666, 671, 672 and 673 Squadrons of the Desert Air Force. They were used also in small numbers by associated Canadian and Dutch squadrons. Their initial deployment in an operational role was during the invasion of Algeria, and they were to prove an indispensible tool in the Sicilian and Italian campaigns. Just three weeks after D-Day, these unarmed lightplanes were in the forefront of the action as the Allied armies advanced into France.

Specification

British Taylorcraft Auster

Type: light liaison/observation aircraft

Powerplant: (Auster Mk V) one 97-kW (130-hp) Lycoming O-290-3 flat-four piston engine

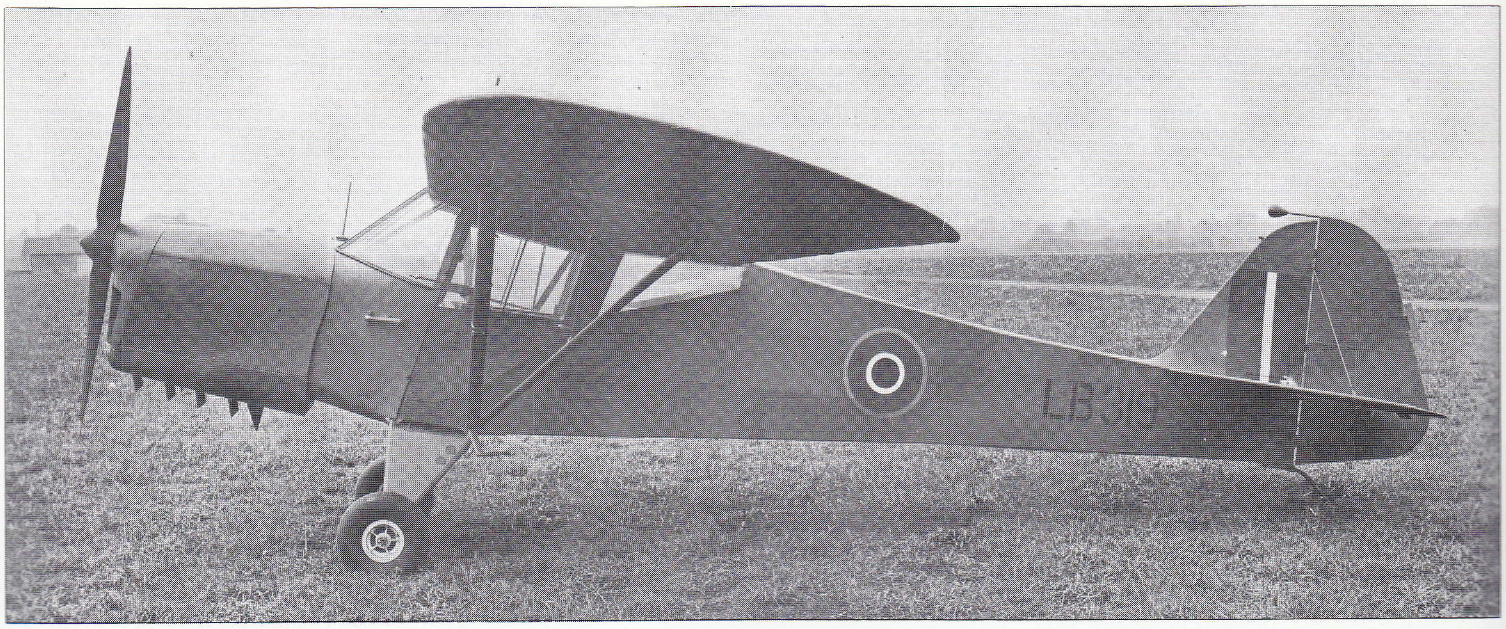
Performance: maximum speed 209 km/h (130 mph) at sea level; cruising speed 180 km/h (112 mph); normal range 402 km (250 miles)

Weights: empty 499 kg (1,100 lb); maximum take-off 839 kg (1,850 lb)

Dimensions: span 10.97 m (36 ft 0 in); length 6.83 m (22 ft 5 in); height 2.44 m (8 ft 0 in); wing area 15.51 m^2 (167.0 sq ft)

Armament: none

Unglamorous and unglamorized artillery observation aircraft played a decisive part in the war; the main British types were the five British Taylorcraft Austers. This is the Mk III, which had a de Havilland Gypsy Major engine.



UK

Westland Lysander

First flown in prototype form during June 1936, the **Westland Lysander** was a two-seat high-wing monoplane army co-operation aircraft with excellent STOL capabilities. The first production series was the **Lysander Mk I**, and aircraft of this version entered service in late 1938 with No. 16 Squadron, based at Old Sarum. Lysanders went on to equip some 30 RAF squadrons, and these served in Europe, the Middle East and the Far East. The type was built in three marks, these being distinguished mainly by the different powerplants used. The Lysander Mk I featured the 664-kW (890-hp) Bristol Mercury XII radial; the **Lysander Mk II**, which was built in the UK by Westland and in Canada by the National Steel Car Corporation, had the 708-kW (950-hp) Bristol Perseus XII radial; and the **Lysander Mk III**, which was also built in the UK and Canada, used the 649-kW (870-hp) Mercury XX or Mercury XXX radial.

The Lysander operated in its intended role for only a short time in the war, European operations confirming that such large and relatively slow aircraft were deathtraps in the presence of determined opposition, both ground and air. However, the type went on to a notably successful second career in air-sea rescue, radar calibration and, perhaps most significantly, agent dropping and recovery in occupied Europe. Total production was 1,368 aircraft.

Specification

Westland Lysander Mk I

Type: two-seat army co-operation aircraft and short-range tactical reconnaissance aircraft

Powerplant: one (664-kW) 890-hp Bristol Mercury XII radial piston engine

Performance: maximum speed 369 km/h (229 mph) at 3050 m (10,000 ft); climb to 3050 m (10,000 ft) in 5.5 minutes; service ceiling 7925 m (26,000 ft); range 966 km (600 miles)

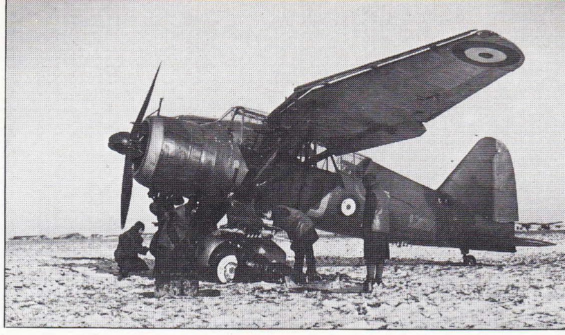
Weights: empty 1844 kg (4,065 lb); normal loaded 2685 kg (5,920 lb)

Dimensions: span 15.24 m (50 ft 0 in); length 9.30 m (30 ft 6 in); height 3.51 m (11 ft 6 in); wing area 24.15 m^2 (260.0 sq ft)

Armament: two forward-firing 7.7-mm (0.303-in) machine-guns in wheel fairings and two 7.7-mm (0.303-in) machine-guns in the rear cockpit, plus provision for eight 9.07-kg (20-lb) bombs on stub winglets

Lysander in Action

The Westland Lysander was developed for light support missions and army co-operation duties, but experience in France during 1940 proved its vulnerability to German fighters. However, the Lysander soon found itself a new role ferrying agents in and out of German-occupied Europe under cover of darkness.



A Lysander of No. 13 Sqn is seen in a field in France during the winter of the 'Phoney War'. When the German offensive of May 1940 burst through France, losses among the Lysander squadrons were high as they operated unescorted over the battlefield in the face of Messerschmitt opposition.

At the beginning of World War II the Royal Air Force included the task of army co-operation well down its list of operational priorities, this despite the fact that collaboration with the British army in France had, during World War I, been the raison d'etre of the RFC on the Western Front. Between the world wars development had continued of such aircraft as the Armstrong Whitworth Atlas and Hawker Audax for the support of ground forces, principally as the eyes of the soldiers engaged in policing activities on the North West Frontier of India and in the Middle East. In 1934, as token recognition that the biplane would disappear in due course, the Air Ministry issued a requirement (Specification A.39/34) for a monoplane to replace the Audax and, on 15 June 1936, the prototype Westland Lysander two-seat high-wing monoplane was flown at the RAF airfield at Boscombe Down. Designed by Teddy Petter, the Lysander made little attempt to extend the operational capabilities beyond those of the Audax: three machine-guns, a message pick-up hook and a small clutch of light bombs were the extent of its equipment. However, Petter recognized one vital quality missing from the earlier biplanes, an ability to fly very slowly, a performance characteristic much requested by the service crews. Accordingly, by use of a high-lift wing with full-span slats, large trailing-edge flaps and generous ailerons, the Lysander was (in modern parlance) truly a STOL aircraft, being capable of clearing a 15-m (50-ft) obstacle after a ground run of only 165 m (180 yards), and with a minimum fully-controllable level speed, at normal operational weight, of 80 km/h (50 mph); normal landing speed against a 5-kt wind was about 56 km/h (35 mph)!

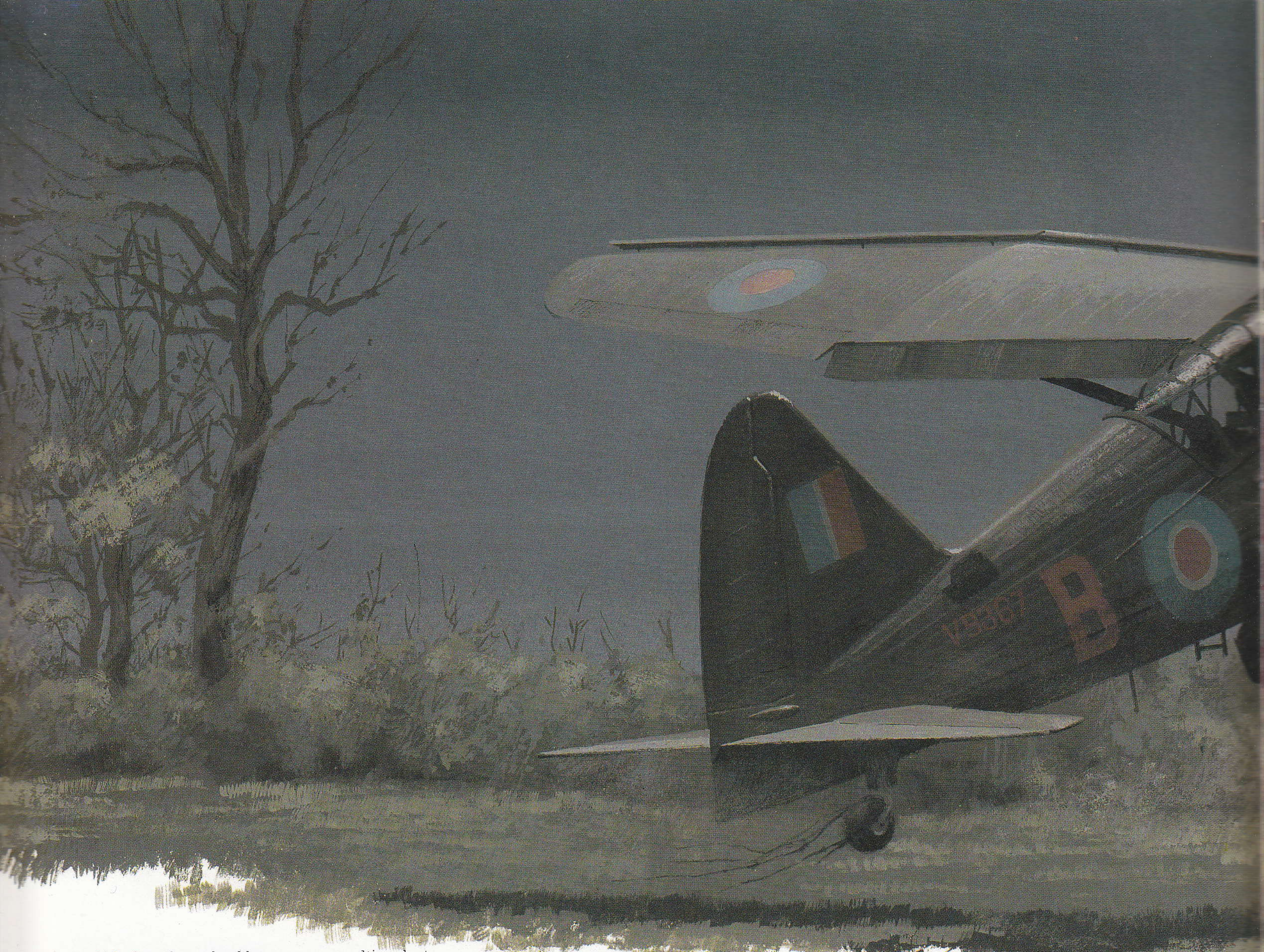
Lack of escorts

During the Battle of France Lysanders of Nos 2, 4, 13, 16 and 25 (Army Co-operation) Squadrons were heavily committed, though the RAF was extraordinarily slow to recognize the need to provide them with fighter escort, and casualties were thus exceptionally heavy. After all, the Luftwaffe had deployed large numbers of Messerschmitt Bf 109Es for the very task of keeping the skies clear of Allied aircraft over the ground battle. Out of 174 Lysanders sent out to France between September 1930 and May 1940 only about 50 returned. Although normal operations were intended to involve only single aircraft, working with a specific ground unit of battalion strength in a well-defined sector of the front (spotting for artillery or performing short-range reconnaissance with hand-held camera in the rear cockpit) there were many occasions when Lysanders were pressed into use as bombers, witness the attack by a whole squadron (using 18-kg/40-lb bombs) on a German motor convoy near Cambrai. On another famous occasion 16 Lysanders and Hawker Hectors (an interim improvement of the Audax biplane) were sent out to drop supplies to the beleaguered garrison at Calais, from which only two aircraft returned.

Although the Luftwaffe had employed its Henschel Hs 126 in exactly the same role for which the Lysander had been intended, the German aircraft had been flown under the conditions of air superiority, while the Lysander had been a 'sitting duck' in the conditions of *Blitzkrieg* that characterized the Battle of France. However, while the General and Air Staffs embarked on a fundamental reappraisal of aircraft duties over the ground battle after the withdrawal from France, the Lysander squadrons were dispersed around the UK to lick their wounds and re-equip. One of their duties during the summer of 1940 was to reconnoitre the whole of southern England, their crews carefully recording every likely field large enough to be used by German gliders in what was thought to be an imminent invasion (so that obstacles could be erected); other aircraft were issued to squadrons for air-sea rescue duties, another task that had been wholly ignored by the RAF before the Battle of Britain; in place of bombs the Lysander carried dinghy packs and smoke floats.

Farther afield the aircraft continued to perform the army co-operation role for which it was originally intended. In the Mediterranean theatre No. 208 Squadron had flown Lysanders since mid-1939, and when Italy entered the war in June the following year the squadron moved to Sidi Barrani, flying frequent artillery spotting sorties around Sollum and Bardia throughout the last six months of 1940. Although air activity over the Western Desert during this period was relatively light, No. 208 learned of the necessity to seek fighter protection for its aircraft (for even such Italian fighters as the Fiat CR.42 proved quite capable of shooting down an unescorted Lysander), so that by the time the squadron was sent to Greece it possessed three Hawker Hurricanes of its own. Once again German fighters severely limited the work done by the Lysanders, despite excellent protection afforded by the Hurricanes. Following the end of the Greek campaign the German radio announced that 'No. 208 Squadron, that invaluable link between the army and the RAF in Greece, had been destroyed and all personnel either killed, seriously wounded or cap-

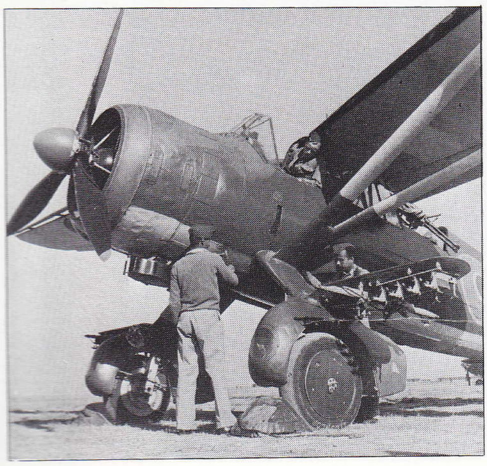
Nos 6 and 208 Sqns flew the Lysander on tasks approximating its designed role in the Middle East. Aircraft of No. 208 Sqn are seen over Ismailia on the Suez canal, during the period when they saw action in Greece, Crete and the desert.



tured.' In fact there had been no casualties, but all the Hurricanes and three Lysanders had been shot down.

That other famous RAF Middle East squadron, No. 6, had also been flying Lysanders in 1940, operating patrols in collaboration with the Palestine Police to keep watch for illegal immigrants, drug-running and to inspect blackout precautions in the Suez Canal Zone. In June of that year the squadron moved up to the Libyan border and subsequently accompanied General Wavell's desert forces on their advance into Cyrenaica. In the later retreat No. 6 Squadron was ordered to remain at Tobruk to provide close support for the trapped garrison, on one occasion shooting down a Junkers Ju 52/3m over Mechili.

At the beginning of 1942 the Lysander was withdrawn from both Nos 6 and 208 Squadrons, no direct replacement for army co-operation duties arriving in the Middle East until the Austers of the air observation post squadrons accompanied the 'Torch' landings at the end of the year. However, the first operational Lysanders to be sent to India had arrived in September 1941 at Kohat for service with No. 28 (Army Co-operation) Squadron. These aircraft were present throughout the retreat in Burma, occasionally being called on to bomb the advancing Japanese forces. The makeshift jungle strips proved inadequate even for the Lysanders, however, and there were several instances when their bombs were torn from their racks during take-off, destroying the aircraft. The other Lysander squadron in Burma was No. 20, this unit persevering with the aircraft for longer than any other army co-operation unit. On one occasion the squadron's Lysanders were called on to drop 18-kg (40-lb) bombs to stampede elephants which had been spotted being used by the Japanese to haul supplies. No. 20 Squadron's Lysanders were not finally replaced by Hurricane Mk IID anti-tank aircraft until the late summer of 1943.



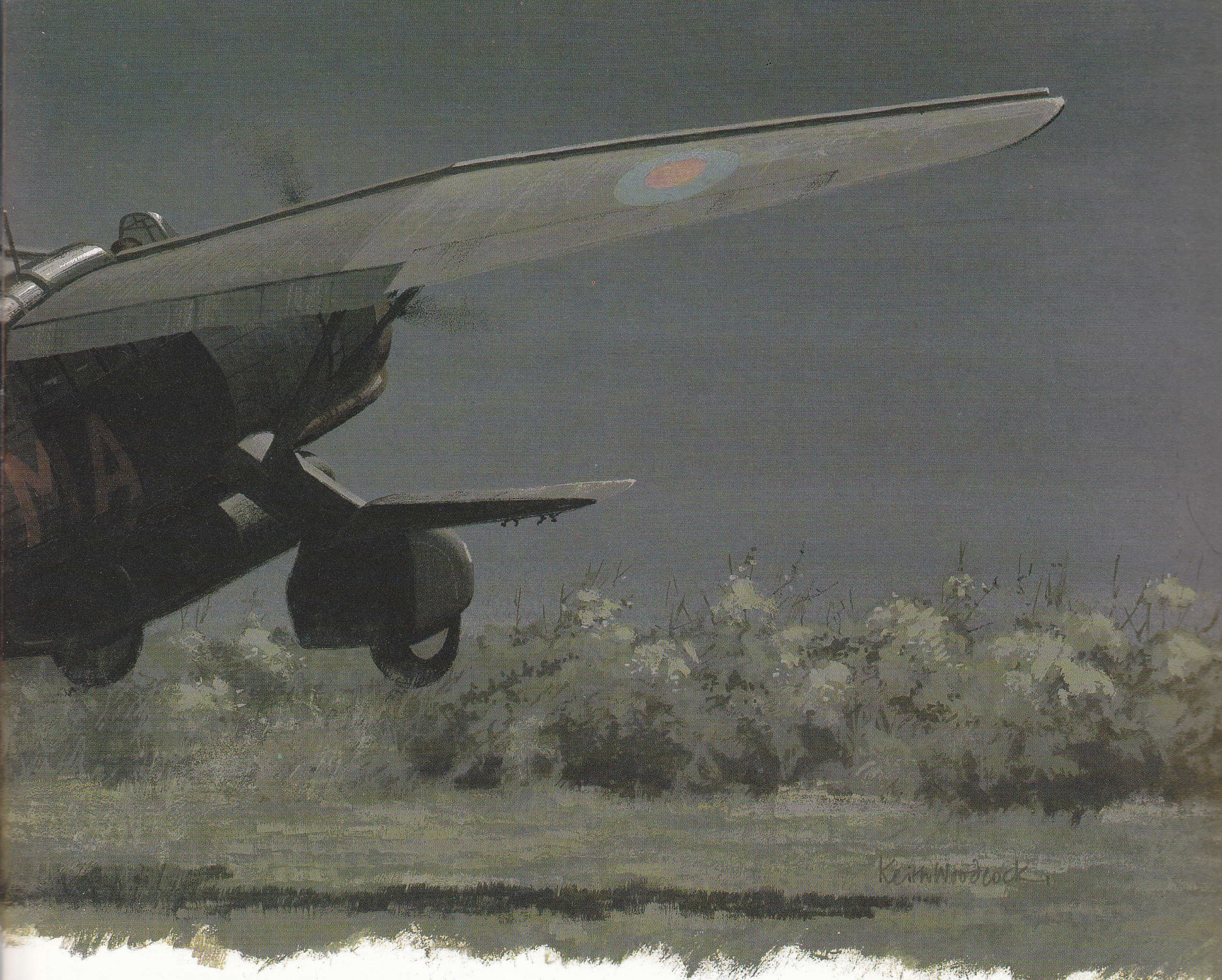
RAF mechanics in India work on a Lysander. The stub wings could carry light bombs and smoke markers, and for defensive purposes air-cooled 0.303-in (7.7-mm) Vickers in the rear cockpit. The Lysander was used in the 1942 Burma campaign.

Despite being cloaked by strict secrecy at the time, the Lysander's most dramatic operations of the war were those flown with the special duties squadrons, formed to undertake clandestine collaboration with the various resistance movements which sprang up throughout German-occupied Europe.

New unit formed

In August 1941 the first such unit, No. 138 (Special Duties) Squadron, was formed at Newmarket with a complement of Lockheed Hudsons, Armstrong Whitworth Whitleys, Lysander Mk IIIs, and later with Handley Page Halifaxes. The squadron's task was to make contact with and drop supplies of ammunition and explosives to partisan forces in France, the Lysanders being called on to land and deliver agents or to pick up a resistance leader for briefing by the Special Operations Executive in London. On other occasions, having landed an agent in France, the Lysander would return to England carrying a shot-down Allied airman who had been sheltered from the Germans by one of the underground movements.

Moving to the secret airfield at Tempsford



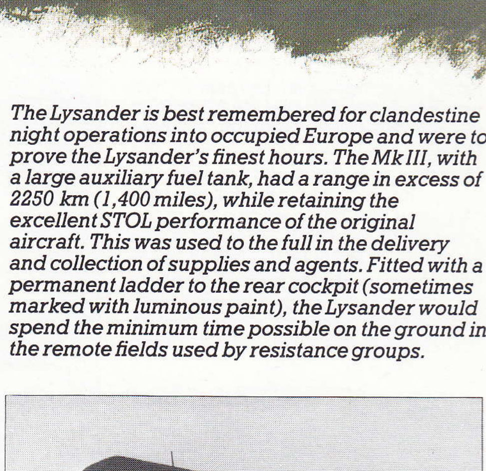
The Lysander is best remembered for clandestine night operations into occupied Europe and were to prove the Lysander's finest hours. The Mk III, with a large auxiliary fuel tank, had a range in excess of 2250 km (1,400 miles), while retaining the excellent STOL performance of the original aircraft. This was used to the full in the delivery and collection of supplies and agents. Fitted with a permanent ladder to the rear cockpit (sometimes marked with luminous paint), the Lysander would spend the minimum time possible on the ground in the remote fields used by resistance groups.

where it was joined by a second unit, No. 161 Squadron (commanded by Wing Commander Edward Fielden, former Captain of the King's Flight in 1936), No. 138 Squadron continued to undertake an increasing volume of covert operations, the Lysanders staging through Tangmere, Lympne or Hawkinge to refuel on their way to France. However, as these operations moved deeper into enemy territory, greater range was demanded of the aircraft and the specially-equipped Lysander Mk IIIA was introduced. Painted matt black overall, this version featured a large additional fuel tank slung under the fuselage, as well as a long boarding ladder (its rungs picked out in luminous paint) to facilitate speedy disembarkation and boarding in enemy territory.

Night hazards

The hazards of these operations were obvious. Night navigation (without radio aids) to an isolated field in blacked-out France demanded extraordinary skill from a pilot who frequently flew without a navigator. The only means of identifying the landing point were three torches held by the 'reception committee', and there was no means of knowing who was holding the torches! Few of the Lysander passengers' names have ever been revealed, although Vincent Auriol, later to become President of France, is known to have made at least one journey by Lysander. In all, the aircraft delivered 293 agents and other passengers ('Joes' as they became known) into France, and more than 500 were brought out.

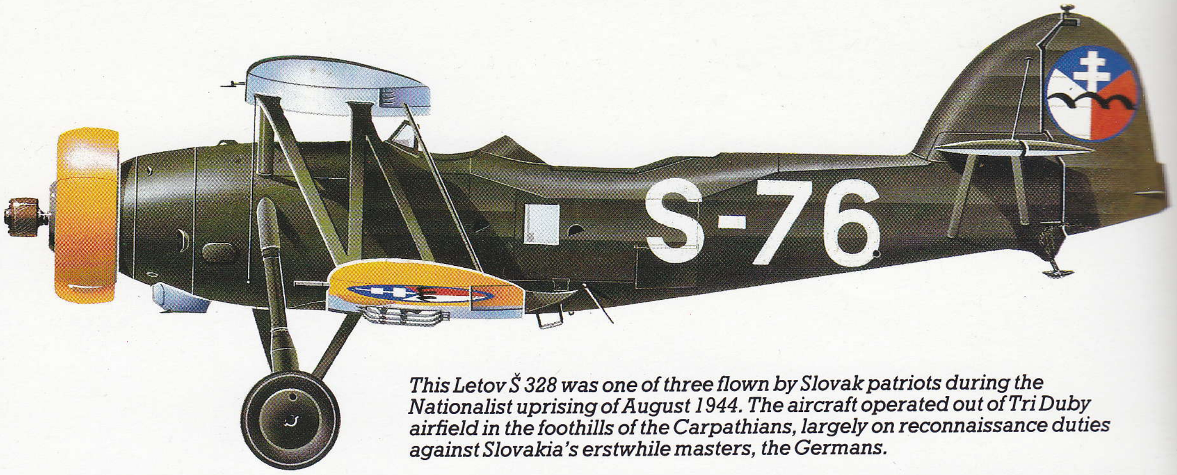
Special duties Lysanders were also used in Burma, six Lysander Mk III(SD)s being shipped to Karachi late in 1944, forming C Flight of No. 357 (Special Duties) Squadron based in turn at Jessore, Meiktila and Mingaladon in Burma. These aircraft differed from the 'European' Lysander Mk IIIA in that they featured specially strengthened landing gear and included a large drinking water container in the rear fuselage. They were heavily involved in conveying agents to and from Force 136 in the jungle and recovering intelligence officers sent forward behind the Japanese lines by the 14th Army. In nine months of these exceptionally dangerous operations only one Lysander was lost to enemy action.



A Westland Lysander of the School of Army Co-operation in 1939. Although it gave its crew an excellent field of vision, the aircraft was too large and too slow to face modern fighter opposition. Similar German aircraft like the Henschel Hs 126 could only operate successfully as the Luftwaffe's fighters gained air superiority.

CZECHOSLOVAKIA

Letov Š 328



This Letov Š 328 was one of three flown by Slovak patriots during the Nationalist uprising of August 1944. The aircraft operated out of Tri Duby airfield in the foothills of the Carpathians, largely on reconnaissance duties against Slovakia's erstwhile masters, the Germans.

The Czech Letov company began in 1932 the design of a general-purpose biplane for service with the Finnish air force. An equal-span single-bay biplane with fixed tailwheel landing gear and conventional braced tail unit, this **Letov Š 328** had accommodation for a pilot and observer/gunner in separate open cockpits in tandem. The **Š 328 F** prototype for Finland was completed during 1933, its powerplant a 433-kW (580-hp) Bristol Pegasus IIM-2 radial engine. Armament comprised two 7.7-mm (0.303-in) forward-firing machine-guns in the upper wing, and two more weapons of the same calibre on a flexible mounting in the rear cockpit. Although no production aircraft were ordered by Finland, political changes and growing tension in Europe caused the Czech air ministry to order the type into production during 1934 for use by its own air force in the role of a bomber/reconnaissance aircraft. A total of 445 was built under the designation Š 328, and most of these were impressed for service with the Luftwaffe or the new Slovak air force when Bohemia-Moravia was occupied by German forces in March 1939, but a small number were later supplied to Bulgaria. When production ended a total of 470 had been built, and included 13 examples of a night-fighter variant designated **Š 328 N** which was armed with four fixed forward-firing and two trainably-mounted machine-guns. Letov had plans to produced developed versions, one **Š 428** prototype resulting from the conversion of an Š 328 production aircraft by replacing the standard powerplant with a 485-kW (650-hp) Avia Vr-36 (licence-built Hispano-Suiza 12Nbr) and with armament of four forward-firing machine-guns.

Slovak Š 328 aircraft took part in the campaign against Poland in 1940 and were operating on the Eastern Front in 1941, but by 1944 there came a reversal of loyalties, many Slovak pilots defecting to the USSR in their Š 328s to take part in operations against the German forces on Soviet territory.

Specification
Letov Š 328

Type: two-seat bomber/reconnaissance aircraft

Powerplant: one 474-kW (635-hp) Walter-built Bristol Pegasus IIM-2 radial piston engine

Performance: maximum speed 280 km/h (174 mph) at 1800 m (5,905 ft); service ceiling 7200 m (23,620 ft); range 700 km (435 miles)

Weights: 1680 kg (3,704 lb); maximum take-off 2675 kg (5,897 lb)

Dimensions: 13.70 m (44 ft 11.4 in); length 10.40 m (34 ft 1.4 in); height 3.40 m (11 ft 1.9 in); wing area 67.10 m^2 (722.28 sq ft)

Armament: four 7.7-mm (0.303-in) machine-guns, two in upper wing and two on flexible mount in rear cockpit, plus up to 500 kg (1,102 lb) of bombs

Widely used on the Eastern Front by Slovak and Luftwaffe pilots, the Š 328 was operated in the battlefield reconnaissance and light bomber roles as well as night harassment missions in 1943.

HUNGARY

Repülögpégyàr Levente

In October 1940 Repülögpégyàr flew the prototype of a parasol-wing two-seat primary trainer which it designated **Repülögpégyàr Levente I**. This was modified subsequently to serve as the prototype of an improved **Levente II** which entered service with the Hungarian air force during 1943. By then, Hungary had allied itself with Germany and had participated in the invasion of the USSR. The result was that the 100 Levente IIs built to serve with the air force as primary trainers were, in fact, deployed with operational squadrons where they were used in communications/liaison roles until the end of the war.

Specification
Repülögpégyàr Levente II

Type: two-seat liaison/training aircraft

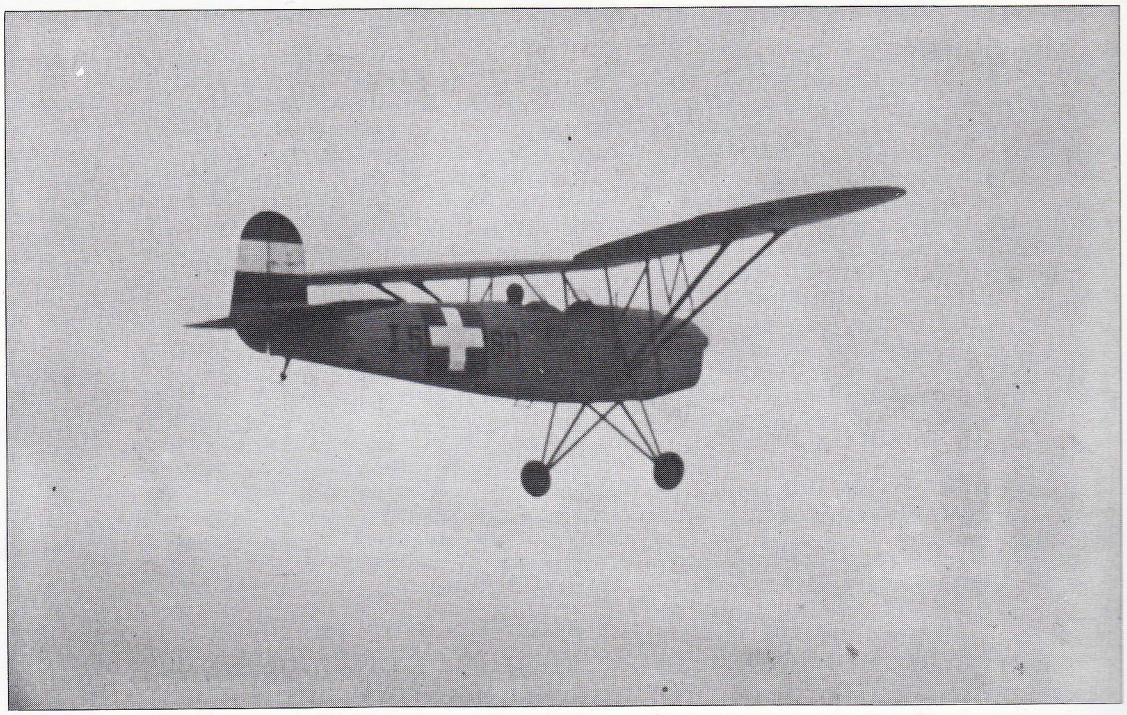
Powerplant: one licence-built 78-kW (105-hp) Hirth HM 504A-2 inverted inline piston engine

Performance: maximum speed 180 km/h (112 mph); cruising speed 160 km/h (99 mph); service ceiling 4500 m (14,765 ft); range 650 km (404 miles)

Weights: 470 kg (1,036 lb); maximum take-off 750 kg (1,653 lb)

Dimensions: span 9.45 m (31 ft 0 in); length 6.08 m (19 ft 11.4 in); height 2.53 m (8 ft 3.6 in); wing area 13.50 m^2 (145.32 sq ft)

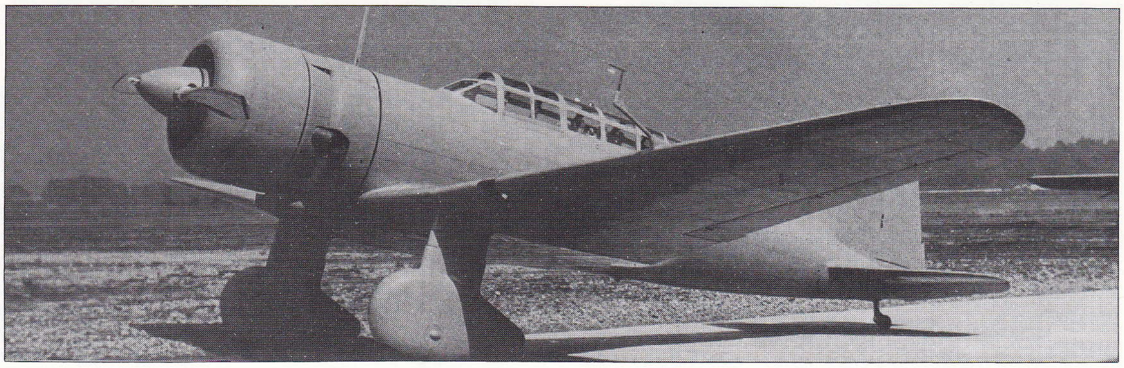
Armament: none



The Levente II was used on the Eastern Front as a communications and liaison aircraft by the Hungarian air force. It was powered by a licence-built Hirth 4-cylinder engine, giving a maximum speed of 180 km/h (112 mph).

JAPAN

Mitsubishi Ki-15



A Navy version of the Ki-15-II designated C5M, featured the small-diameter Ha-26-I engine. For its time the 'Babs', as it came to be called by the Allies, had an excellent performance, superior to some contemporary fighters.

In July 1935 the Imperial Japanese Army drew up its specification for a new two-seat reconnaissance aircraft, and Mitsubishi responded with a cantilever low-wing monoplane, the **Mitsubishi Ki-15**. Service testing was completed without difficulty and the type was ordered into production under the official designation **Army Type 97 Command Reconnaissance Plane Model 1**. In May 1937, a year after the first flight, delivery of production aircraft to the army began.

Just before that, however, military observers in the west should have gained some premonition of Japan's growing capability in aircraft design when the second (civil) prototype was used to establish a new record flight time between Japan and England.

The army's **Ki-15-I** had been received in time to make a significant impact at the beginning of the war with China, the type's high speed giving it freedom of the skies until China introduced the Soviet Polikarpov I-16. However, plans had already been made to upgrade performance of the KI-15-I, this being achieved by installing the 671-kW (900-hp), smaller-diameter Mitsubishi Ha-26-I engine, its incorporation providing an opportunity to overcome what had been the major shortcoming of the type, a poor forward field of view past the large-diameter Nakajima engine. The improved version entered production for the army in September 1939 as the **Ki-15-II**, but before that the Japanese navy, impressed by the performance of this aircraft, ordered 20 examples of the Ki-15-II under the official designation **Navy Type 98 Reconnaissance Plane Model 1**, Mitsubishi designation **C5M1**. The navy acquired subsequently 30 **C5M2** aircraft that were generally similar except for installation of the more powerful 708-kW (950-hp) Nakajima Sakae (prosperity) 12 engine. When production ended almost 500 of all versions had been built, the majority being in first-line service when the Pacific war started. Given the Allied codename **'Babs'**, the type was relegated to second-line roles in early 1943, but many survived to be used in *kamikaze* attacks at the war's end.

Specification

Mitsubishi Ki-15-I

Type: two-seat reconnaissance aircraft

Powerplant: one 477-kW (640-hp) Nakajima Ha-8 radial piston engine

Performance: maximum speed 480 km/h (298 mph) at 4000 m (13,125 ft); cruising speed 320 km/h (199 mph) at 5000 m (16,405 ft); service ceiling 11400 m (37,400 ft); range 2400 km (1,491 miles)

Weights: empty 1400 kg (3,086 lb); maximum take-off 2300 kg (5,071 lb)

Dimensions: span 12.00 m (39 ft 4.4 in); length 8.70 m (28 ft 6.5 in); height 3.35 m (11 ft 0 in); wing area 20.36 m^2 (219.16 sq ft)

Armament: all versions had one 7.7-mm (0.303-in) machine-gun on a trainable mount in the rear cockpit

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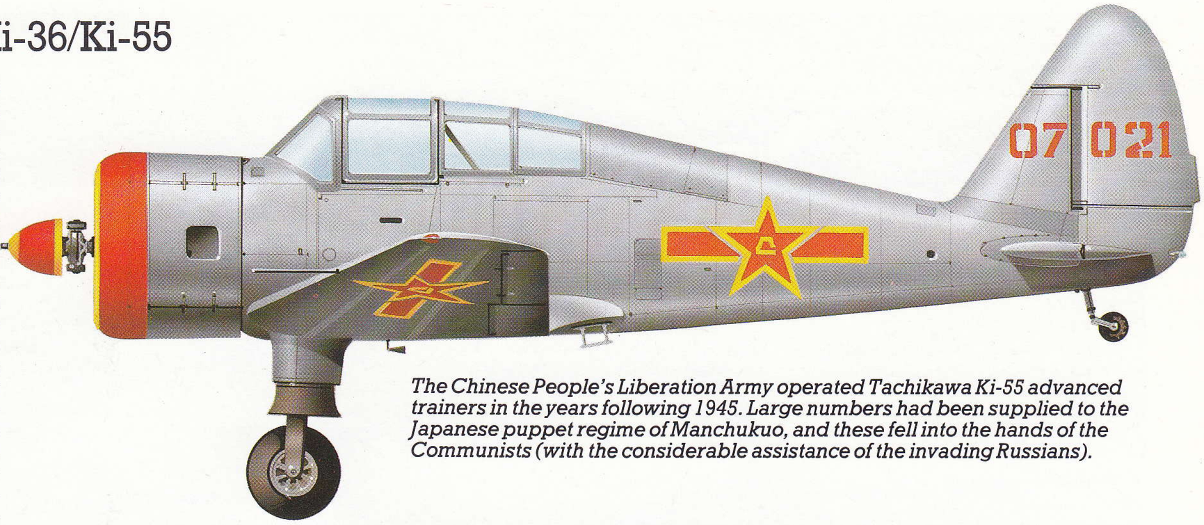
JAPAN

Tachikawa Ki-36/Ki-55



The Chinese People's Liberation Army operated Tachikawa Ki-55 advanced trainers in the years following 1945. Large numbers had been supplied to the Japanese puppet regime of Manchukuo, and these fell into the hands of the Communists (with the considerable assistance of the invading Russians).

First flown in prototype form on 20 April 1938, the **Tachikawa Ki-36** was a cantilever low-wing monoplane of all-metal basic structure, covered by a mix of light alloy and fabric. Landing gear was of fixed tailwheel type, the main units enclosed in speed fairings, and power was provided by a 336-kW (450-hp) Hitachi Ha-13 radial engine. The two-man crew was enclosed by a long 'greenhouse' canopy and both men had good fields of view, that of the observer being improved by clear-view panels in the floor. The type was ordered into production in November 1938 as the **Army Type 98 Direct Co-Operation Plane**. Generally similar to the prototypes, the type was armed with two 7.7-mm (0.303-in) machine-guns and introduced the more powerful Hitachi Ha-13a engine. When construction ended in January 1944, a total of 1,334 had been built by Tachikawa (862) and Kawasaki (472).

The handling characteristics and reliability of the Ki-36 made the army realize that it was ideal for use as an advanced trainer, resulting in development of the **Ki-55**, intended specifically for this role and having armament reduced to a single forward-firing machine-gun. Following the testing of a prototype in September 1939, the army ordered this aircraft as the **Army Type 99 Advanced Trainer**; when production was terminated in December 1943 a total of 1,389 had been built by Tachikawa (1,078) and Kawasaki (311).

Both versions were allocated the Allied codename **'Ida'**, and the Ki-36 was first deployed with considerable success in China. However, when confronted by Allied fighters at the beginning of the Pacific War it was found to be too vulnerable, being redeployed in China where it was less likely to be confronted by such aircraft. It was also considered suitable for *kamikaze* use in the closing stages of the war, being modified to carry internally a bomb of up to 500 kg (1,102 lb).

Specification

Tachikawa Ki-36

Type:

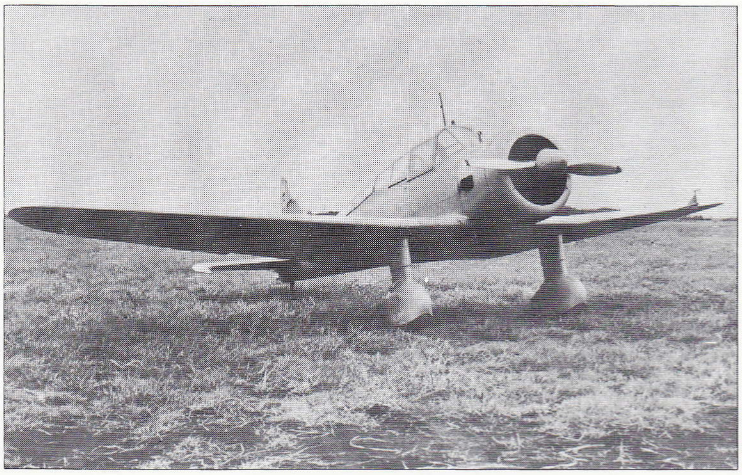
Powerplant: one 380-kW (510-hp) Hitachi Ha-13a radial piston engine

Performance: maximum speed 348 km/h (216 mph) at 1800 m (5,905 ft); cruising speed 235 km/h (146 mph); service ceiling 8150 m (26,740 ft); range 1235 km (767 miles)

Weights: empty 1247 kg (2,749 lb); maximum take-off 1660 kg (3,660 lb)

Dimensions: span 11.80 m (38 ft 8.6 in); length 8.00 m (25 ft 3 in); height 3.64 m (11 ft 11.3 in); wing area 20.00 m^2 (215.29 sq ft)

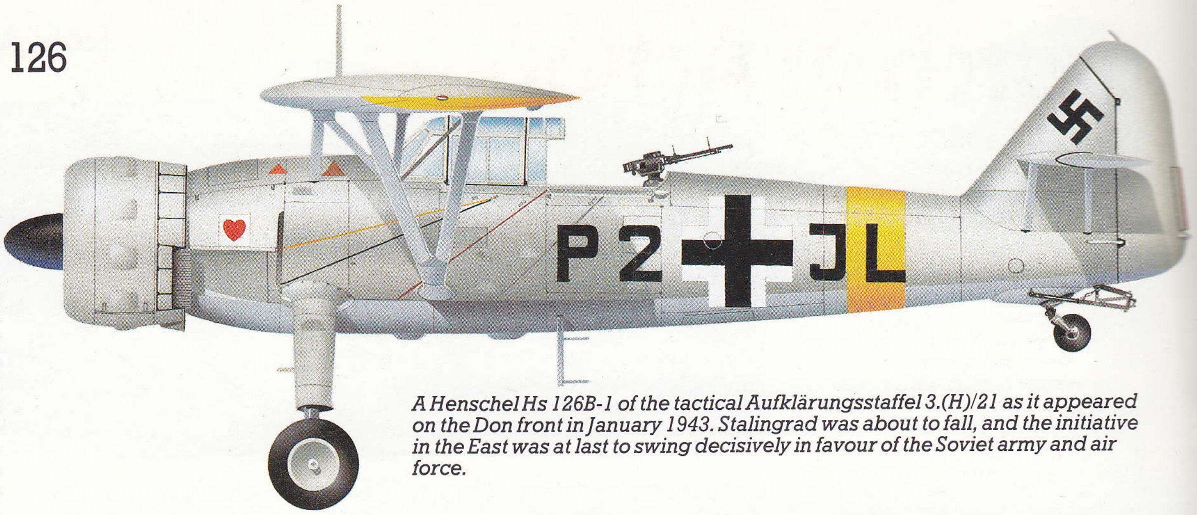
Armament: two 7.7-mm (0.303-in) machine-guns (one forward-firing and one on a trainable mounting in the rear cockpit), plus an external bombload of up to 150 kg (331 lb)



The Type 98 Chokusetsu-Kyodoki (Direct Co-operation Plane) was built by Tachikawa under the designation Ki-36. Trainer versions were designated Ki-55 and were used for kamikaze attacks late in the war.

GERMANY

Henschel Hs 126



A Henschel Hs 126B-1 of the tactical Aufklärungsstaffel 3.(H)/21 as it appeared on the Don front in January 1943. Stalingrad was about to fall, and the initiative in the East was at last to swing decisively in favour of the Soviet army and air force.

In 1935 Henschel developed the parasol-wing Henschel Hs 122 short-range reconnaissance aircraft as a replacement for the Heinkel He 45 and He 46, but although a few of the 492-kW (660-hp) Siemens SAM 22B-engined aircraft were built, the Hs 122 was not adopted for Luftwaffe use. From it, however, Henschel's chief designer Friedrich Nicolaus derived the **Henschel Hs 126** which incorporated a new wing, cantilever main landing gear and a canopy over the pilot's cockpit, the observer's position being left open. During 1937 Henschel built 10 pre-production **Hs 126A-0** aircraft based on the third prototype, and some were used for operational evaluation by the Luftwaffe's Lehrgruppe reconnaissance unit in the spring of 1938. Initial production version was the **Hs 126A-1**, generally similar to the pre-production aircraft but powered by the 656-kW (880-hp) BMW 132dc radial engine. Armament comprised one forward-firing 7.92-mm (0.31-in) MG 17 machine-gun, plus one similar weapon on a trainable mounting in the rear cockpit, and five 10-kg (22-lb) bombs or a single 50-kg (110-lb) bomb could be carried on an underfuselage rack. A hand-held Rb 12.5/9×7 camera in the rear cockpit was supplemented by a Zeiss instrument in a rear-fuselage bay. Six of this version were used by the Legion Condor in Spain during 1938, being transferred later to the Spanish air force, and 16 were delivered to the Greek air force. An improved but similar **He 126B-1** was introduced during the summer of 1939, this incorporating FuG 17 radio equipment and either the Bramo 323A-1 or 671-kW (900-hp) 323A-2.

Production aircraft were built in Berlin, at Schönefeld and Johannisthal, from 1938 and entered operational service first with AufklGr. 35. By the outbreak of World War II the re-equipment of He 45- and He 46-equipped reconnaissance units with the Hs 126 was well under way. The type was withdrawn progressively from frontline service during 1942 on replacement by the Focke-Wulf Fw 189. Just over 600 aircraft were built.

Specification

Henschel Hs 126B-1

Type: two-seat short-range reconnaissance aircraft

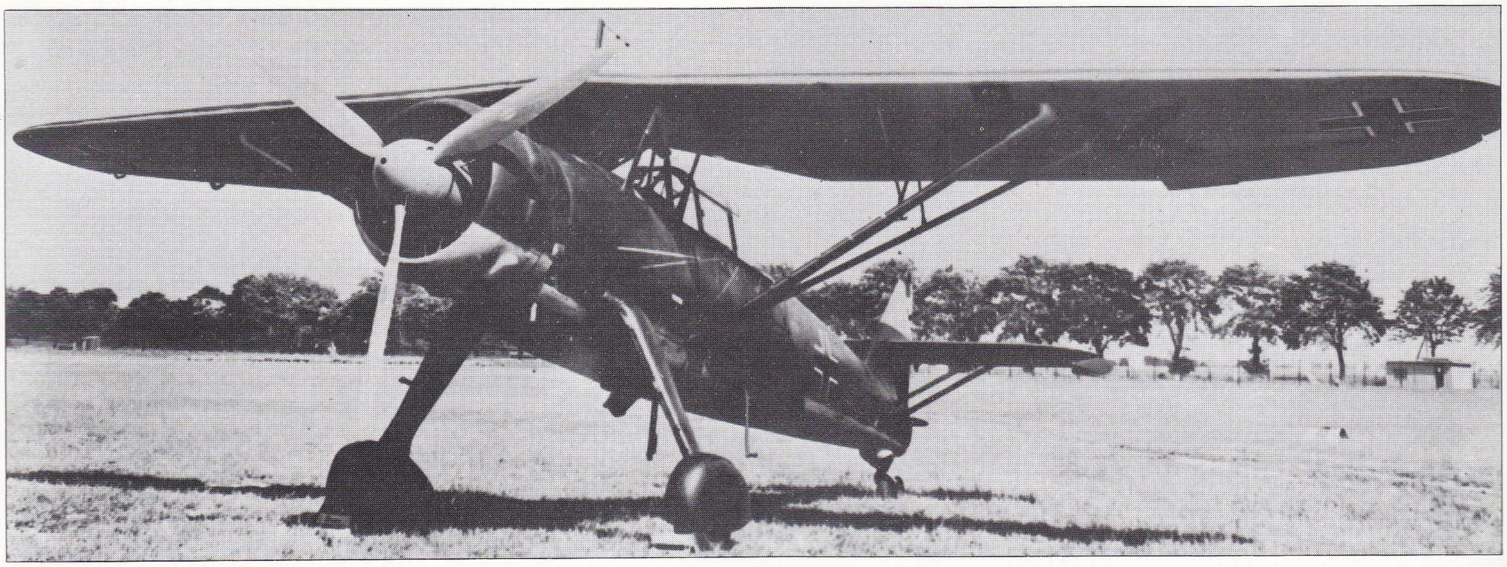
Powerplant: one 634-kw (850-hp) Bramo 323A-1 radial piston engine

Performance: maximum speed 310 km/h (193 mph) at sea level; service ceiling 8300 m (27,230 ft); maximum range 720 km (447 miles)

Weights: empty 2030 kg (4,475 lb); maximum take-off 3090 kg (6,812 lb)

Dimensions: span 14.50 m (47 ft 6.9 in); length 10.85 m (35 ft 7.2 in); height 3.75 m (12 ft 3.6 in); wing area 31.60 m^2 (340.15 sq ft)

Armament: two 7.92-mm (0.31-in) MG 17 machine-guns, plus one 50-kg (110-lb) or five 10-kg (22-lb) bombs



An early Hs 126 in pre-war markings displays the distinctive parasol wing. A contemporary of the Lysander, the Henschel was initially more successful because it operated under a protective umbrella of Messerschmitt Bf 109 fighters and in conditions of near-total air superiority.

GERMANY

Fieseler Fi 156 Storch

Best-known of all the Fieseler designs because of its extensive use during World War II, the **Fieseler Fi 156 Storch** (stork) was a remarkable STOL (short take-off and landing) aircraft that was first flown during the early months of 1936. A braced high-wing monoplane of mixed construction, with a conventional braced tail unit and fixed tailskid landing gear with long stroke main units, the Fi 156 was powered by an Argus inverted-Vee piston engine, and its extensively glazed cabin provided an excellent view for its three-man crew. As with the Fi 97, the key to the success of this aircraft was its wing incorporating the company's high-lift devices. The capability of this aircraft more than exceeded its STOL expectations, for with little more than a light breeze blowing it needed a take-off run of only about 60 m (200 ft) and could land in about one-third of that distance.

Service tests confirmed that Germany's armed forces had acquired a 'go-anywhere' aircraft, and for the remainder of World War II the Storch was found virtually everywhere German forces operated, production of all variants totalling 2,549 aircraft. The designation **Fi 156C-1** applied to a variant intended to be deployed in liaison and staff transport roles, and the **Fi 156C-2** was basically a two-crew reconnaissance version carrying a single camera; some late examples of the Fi 156C-2 were, however, equipped to carry one stretcher for casualty evacuation. The **Fi 156C-3** was the first to be equipped for multi-purpose use, the majority of the type being powered by the improved Argus As 10P engine, which was also standard in the generally similar **Fi 156C-5** which had provision to carry an underfuselage camera or jettisonable fuel tank.

Because of their capability, Fi 156s were used in some remarkable exploits. Best known are the rescue of Benito Mussolini from imprisonment in a hotel amid the Apennine mountains, on 12 September 1943, and the flight made by Hanna Reitsch into the ruins of Berlin on 26 April 1945, carrying Generaloberst Ritter von Greim to be appointed by Adolf Hitler as his new commander of the Luftwaffe.

Specification

Fieseler Fi 156C-2

Type: two-seat army co-operation/ reconnaissance aircraft

Powerplant: one 179-kW (240-hp) Argus As 10C-3 inverted-Vee piston engine

Performance: maximum speed 170 km/h (109 mph) at sea level; economical cruising speed 130 km/h (81 mph); service ceiling 4600 m (15,090 ft); range 385 km (239 miles)

Weights: empty 930 kg (2,050 lb); maximum take-off 1325 kg (2,921 lb)

Dimensions: span 14.25 m (46 ft 9 in); length 9.90 m (32 ft 5.8 in); 3.05 m (10 ft 0 in); wing area 26.00 m^2 (279.87 sq ft)

Armament: one rear-firing 7.92-mm (0.31-in) machine-gun on trainable mount

Storch in Action

The hard-won lessons of the final year of World War I were forgotten by the victors in a great many military fields, but none more so than in the field of airborne support of the forces on the ground. As is so often the case, it was the losers who learned the most, although it may be that the Germans went too far in their espousal of total subordination of the air force to the army.

General Erwin Rommel confers with a captain in the Luftwaffe, the pilot of a reconnaissance Storch. Rommel made extensive use of this versatile aircraft, as did those Allied commanders whose forces captured them in operating order.

The Fieseler Fi 156 Storch (stork) was an excellent example of a sound basic design concept being exploited, cheaply and effectively, to undertake a wide range of duties without deterioration of its superb handling qualities.

Product of the fertile brains of Gerhard Fiesler and his chief designer, Rheinhold Mewes, the Storch was the result of an RLM requirement issued in 1935 for a light liaison aircraft capable of operating from hastily-prepared landing strips close behind the front line. At that time it was not envisaged that such an aircraft would be required to undertake operational tasks, being regarded, on account of its implied low speed, as too vulnerable to small arms fire from the ground.

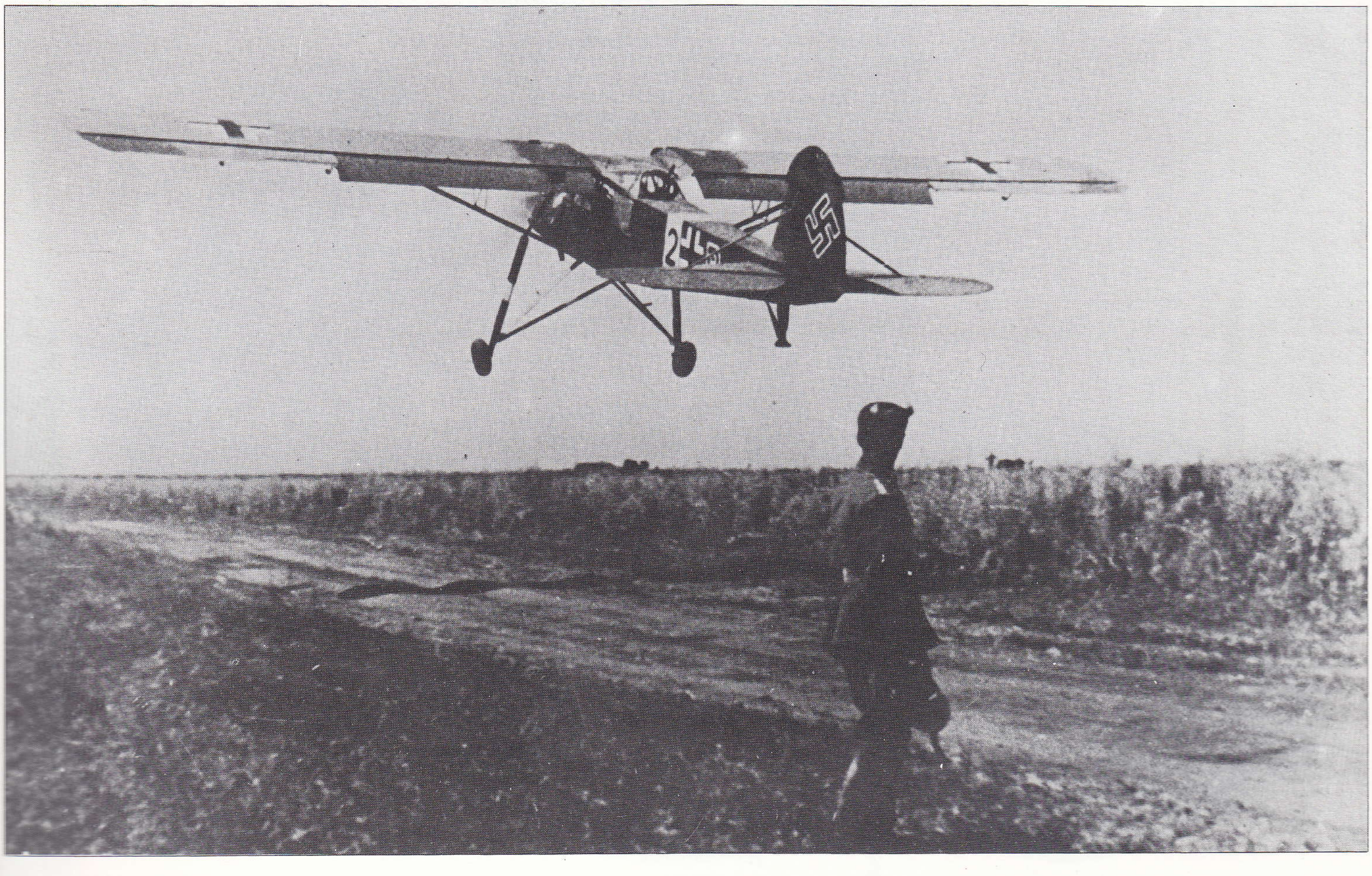
Beating competing designs from Messerschmitt and Siebel (as well as the Focke-Wulf Fw 186 autogiro), the Storch entered production late in 1936 and the first production version, the Fi 156A-1, appeared the following year. With its small Argus inverted-Vee air-cooled engine the Storch quickly demonstrated amazing flying qualities, being capable of getting airborne after a ground run, against a 5-kt wind, of only about 55 m (60 yards) and a minimum fully-controlled level speed of around 53 km/h (32 mph). Such performance was achieved by use of a high-aspect-ratio, high-lift wing with full-span slats and flaps. The cabin, capable of accommodating up to four occupants, was provided with extensive glazing with bulged side panels, which gave rise to the nicknames *Glashasten* (glassbox) and *Gewächshaus* (greenhouse) and enabled the occupants to see almost directly below the aircraft while flying with wings level! The Storch's long-travel, wide-track landing gear allowed it to operate from just the sort of rudimentary strips envisaged by the RLM.

Before World War II Störche were used almost exclusively as staff transport and communications aircraft, although a *Kette* of Fi 156A-1s was sent to Spain in 1937 for battlefield work, flying from Burgo de Osma; after two of these had been shot down by Republican fighters the others were flown on general communications work behind the Nationalist lines. These losses prompted the RLM to ask Fieseler to introduce a machine-gun mounting in the rear roof of the cabin to provide a measure of self defence. In service with divisional staffs in Germany, Störche were commonplace sights parked in the motor transport pool, their wings folded to avoid damage by careless drivers!

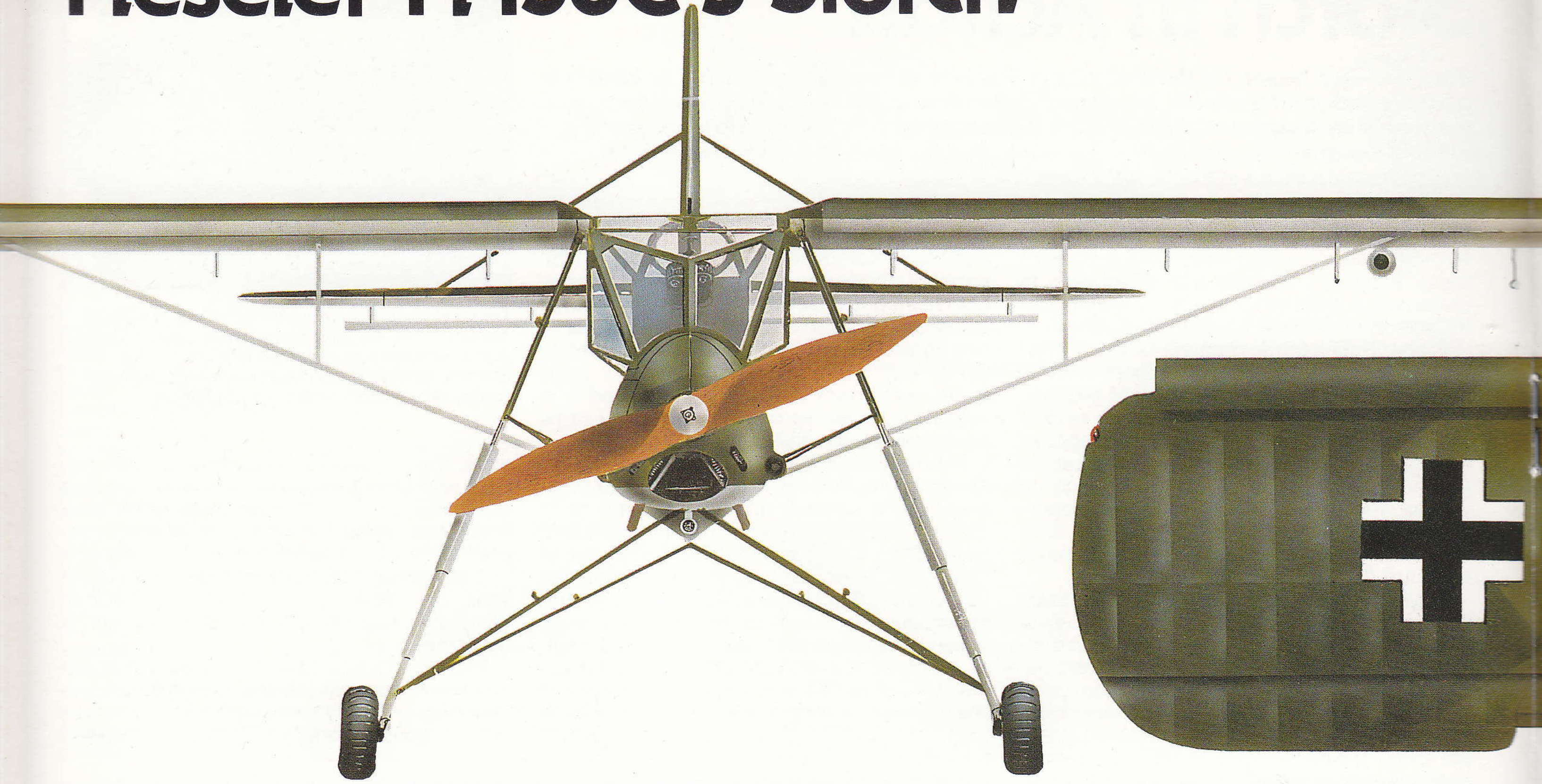
The new gun-armed Fi 156C series appeared in 1939, subvariants including the Fi 156C-1 with marginally improved comfort for staff officer accommodation, the Fi 156C-2 equipped for short-range battlefield surveillance, the Fi 156C-3 with improved Argus engine and interchangeable wheel/ski landing gear, and the Fi-156C-5 with provision for a small long-range fuel tank (which almost trebled the Storch's range). A few pre-production Fi 156C-0s had been sent to Spain earlier in the year, but these were on their way back to Germany when World War II broke out in September.

The Storch was present during the Polish and Norwegian campaigns, though almost exclusively as a staff transport; it was however being used increasingly to fly slightly wounded

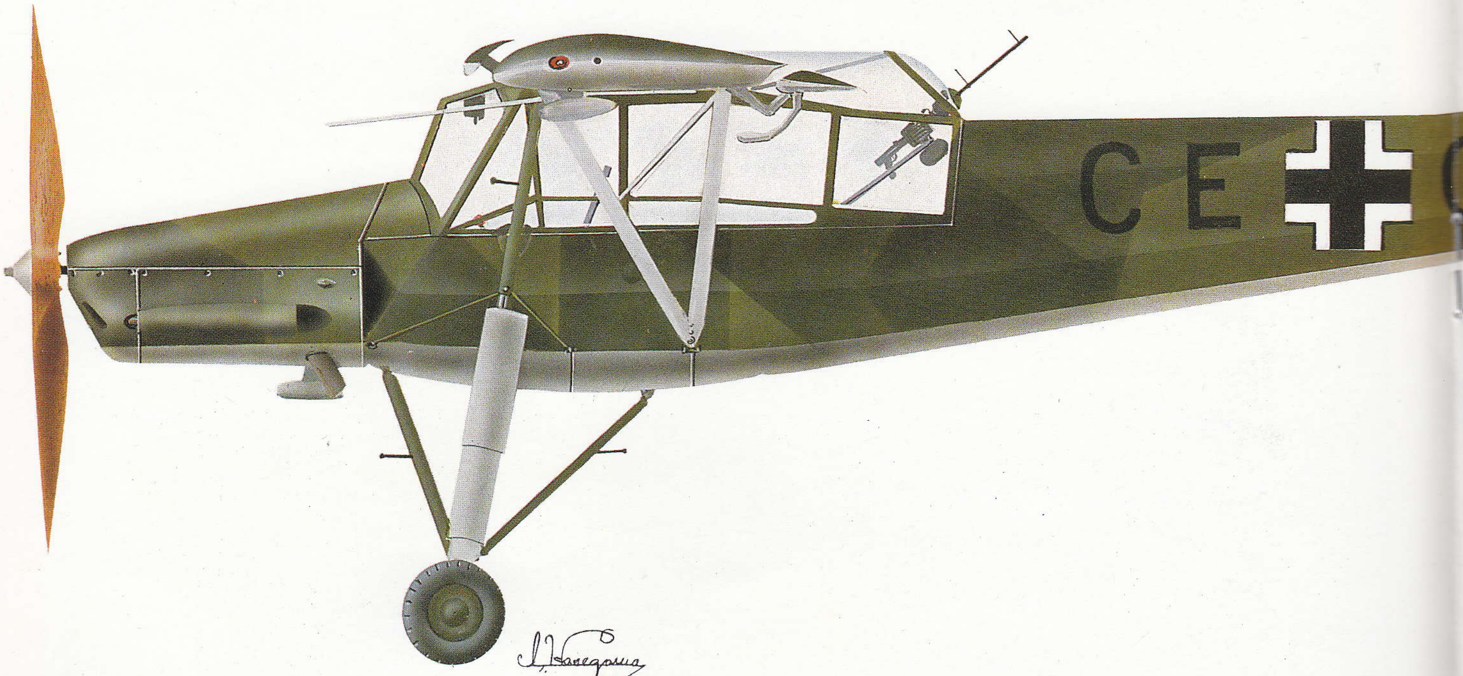
An Fi 156 Storch from Kurierstaffel Ob.d.L. (Courier Squadron, Luftwaffe High Command) takes off from an improvised landing strip on the Don Front, 13 August 1942. In ten days' time, the 6th Army was to reach the Volga and begin the battle for Stalingrad.

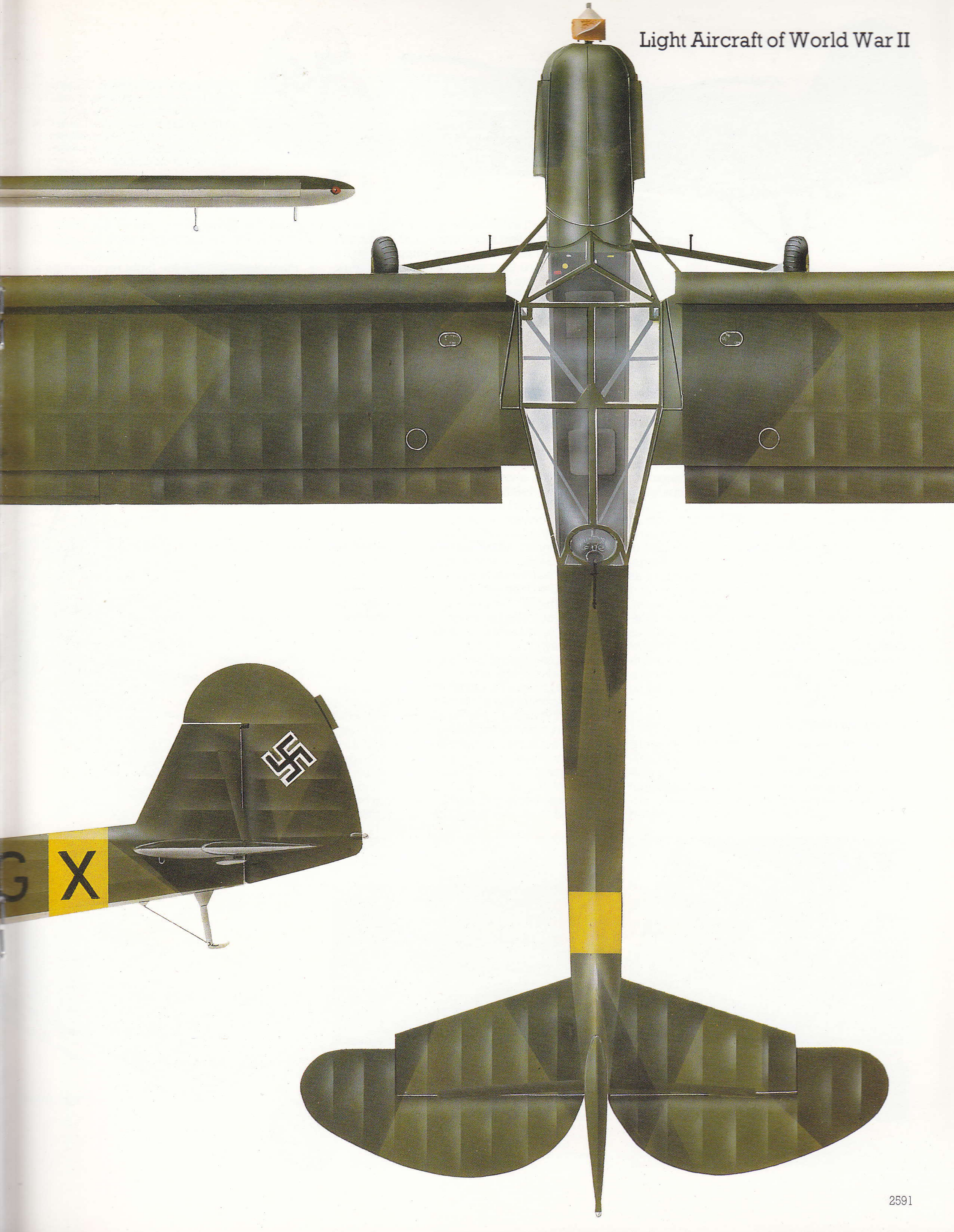


Fieseler Fi 156C-3 Storch



Without doubt the Fieseler Storch was the prime example of an army co-operation and observation aircraft, and was certainly the design by which other types operating in these roles were judged. This view of an Fi 156C-3 in Eastern Front colours clearly illustrates the purposeful design of the undercarriage with the long compression legs incorporating long-stroke, oil-damping shock absorbers of high vertical descent rates. Such was the success of the Storch in its intended role that trials were conducted around supply-dropping, coastal patrol and light bombing roles, although only as secondary operations.

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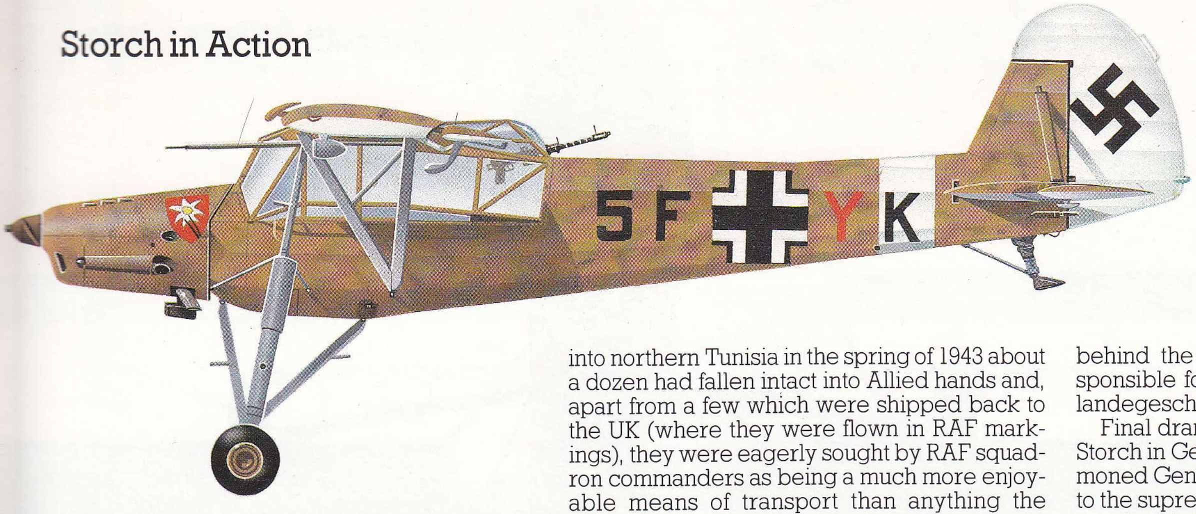
Storch in Action



A Fieseler Fi 156C-3/Trop Storch of 2.(H)/14 Aufklärungsstaffel operating under Afrika Korps control in the spring of 1941. In its spotting role the Storch was essential to successful mobile war across the expanses of the desert.

personnel out of the front line. Not until late 1940 or early 1941 did the first dedicated ambulance version, the Fi 156D-1 *Sanitätsflugzeug*, enter service with accommodation for a single stretcher, access for which was through a hinged panel in the starboard side of the rear fuselage. This version was widely used in Western Europe during the latter part of the Winter Blitz against British cities, ferrying wounded aircrew from the bomber bases back home to German military hospitals. It also accompanied the Luftwaffe to the central Mediterranean in early 1941, and during the Balkan campaign in April, and soon after this to North Africa; tropicalized versions (the Fi 156C-5/Trop and Fi 156D-1/Trop) were widely used, particularly for the rescue of shot-down pilots stranded in the Western Desert. General staff officers, especially such well known commanders as Generalfeldmarschall Albert Kesselring and General Erwin Rommel, are said to have infinitely preferred the use of their personal Störche to that of their larger, more prestigious transports, on account of their ability to move about the front line with much greater informality. For such movements by senior officers, headquarters X Fliegerkorps was assigned no fewer than 15 Störche.

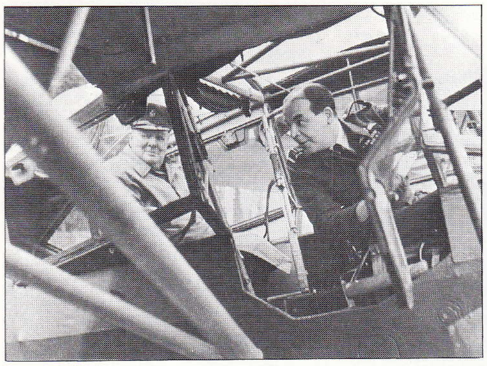
Desert service

Some of the longest serving aircraft were those of the two *Wüstennotstaffeln* (desert rescue squadrons), the Storch being afforded particular care and maintenance, so important were they regarded by the operational aircrew! By the time the Axis forces had retreated into northern Tunisia in the spring of 1943 about a dozen had fallen intact into Allied hands and, apart from a few which were shipped back to the UK (where they were flown in RAF markings), they were eagerly sought by RAF squadron commanders as being a much more enjoyable means of transport than anything the Allied Communications squadrons had to offer. Other examples managed to make good their escape from Tunisia to Sicily where, amid the chaos created on Axis airfields and on the roads by Allied bombing, they were often the only form of transport available between component fighter *Gruppen* dispersed throughout the island. Oberst Johannes Steinhoff, the *Geschwaderkommodore* of JG 77, provides ample testimony to the value of the Storch in Sicily in his *Die Strass von Messina: Tagebuch des Kommodore*, a vivid account of the Luftwaffe's attempts to defend the island.

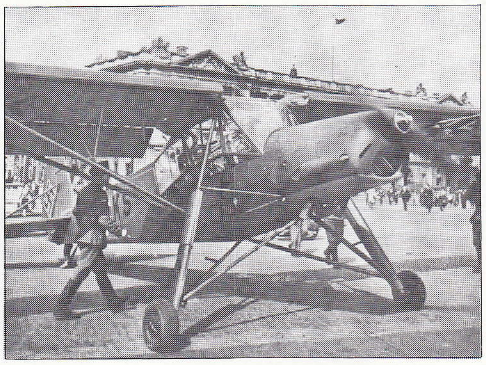
Before leaving the Mediterranean one other exploit involving the Storch is worth mention. On 12 September 1943, shortly after Italy's surrender, Benito Mussolini was imprisoned on the Gran Sasso in central Italy, a mountain fortress that was virtually inaccessible by conventional ground forces. On direct orders from Hitler himself, the position was stormed by German airborne forces led by Oberstleutnant Otto Skorzeny before the deposed dictator was spirited away aboard a Storch, only to suffer death by lynching at the hands of his own countrymen later in the war.

On the Eastern Front the Storch served operationally during the early period of German air superiority, being flown by *Heeresauflärungsgruppen* (army reconnaissance groups) 14 and 21, often equipped with ski landing gear during the first two harsh Russian winters. Störche provided almost continuous artillery spotting in the course of the desperate fighting around the Demyansk pocket in April 1942. They were also used to deliver small groups of saboteurs behind the Soviet lines, one of the units responsible for this hazardous work being Luftlandegeschwader (air landing group) 1.

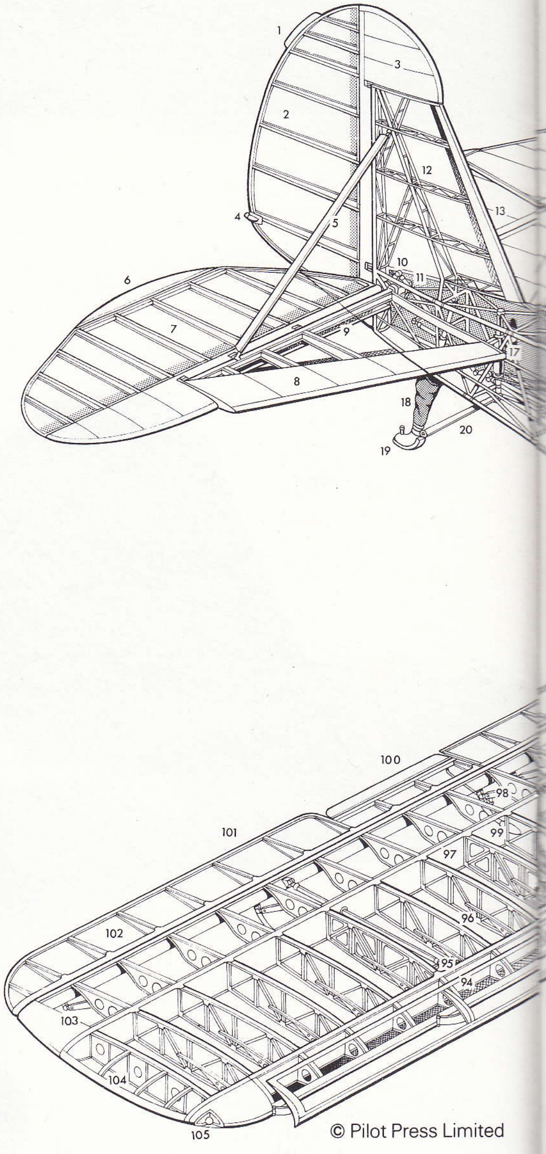
Final dramatic wartime flight recorded by a Storch in Germany was made when Hitler summoned Generaloberst Robert Ritter von Greim to the supreme command bunker in Berlin; this was for his formal promotion to take command of the Luftwaffe on 23 April 1945 following the disgrace of Hermann Goering. Flown by the famous woman pilot, Hanna Reitsch, the Storch carried von Greim from Gatow airfield, landing in a street in the centre of the devastated capital.



23 July 1944, and Winston Churchill sits in the Storch (piloted by Air Vice-Marshal Broadhurst) which is to take him on a tour of the Normandy beach-head. The aircraft was captured in North Africa in 1943.



A Storch brings a senior officer onto the Place de la Concorde in Paris following the fall of France. Not many aircraft could land safely even in such a large urban open space, but it was little problem to a Storch pilot.



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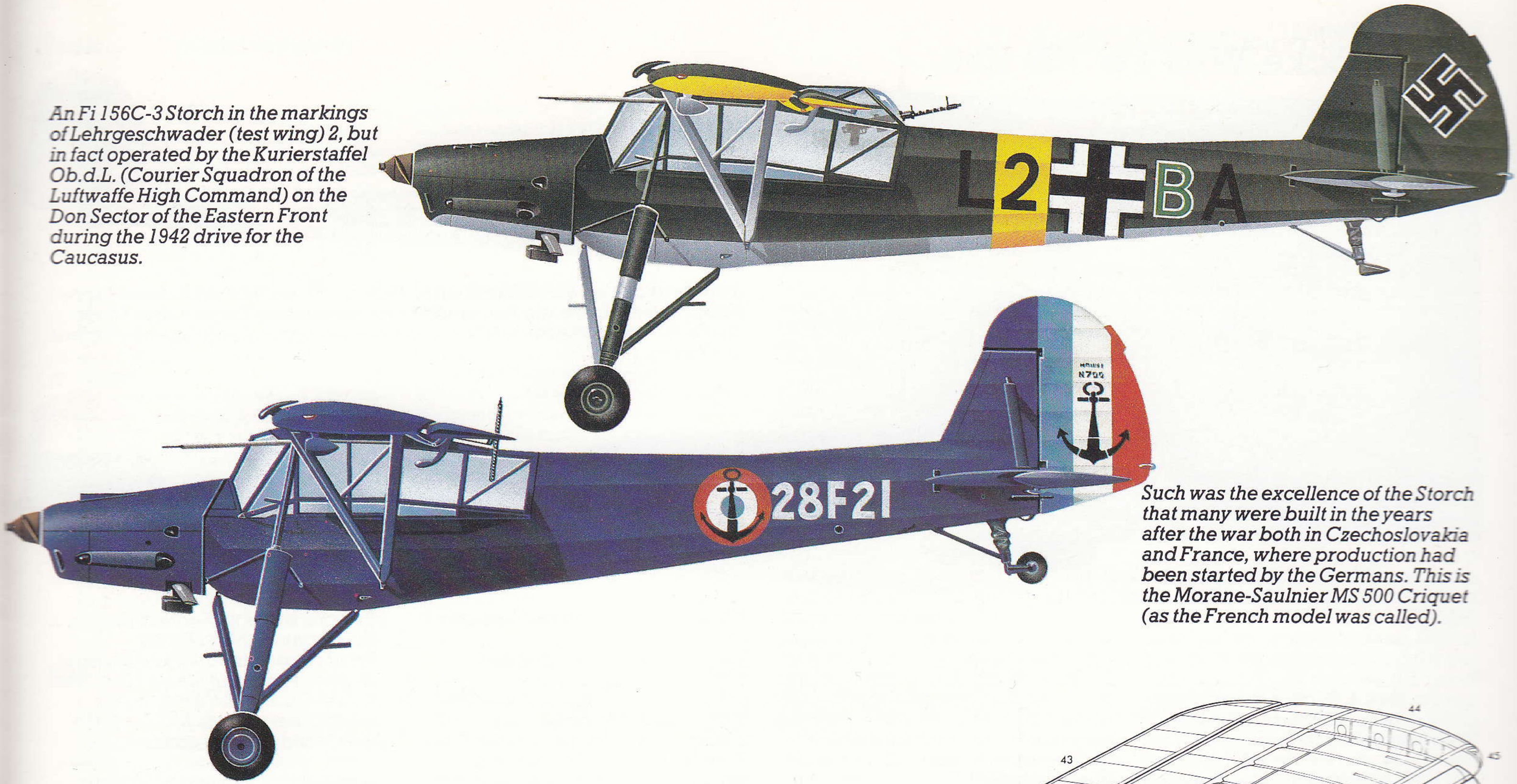
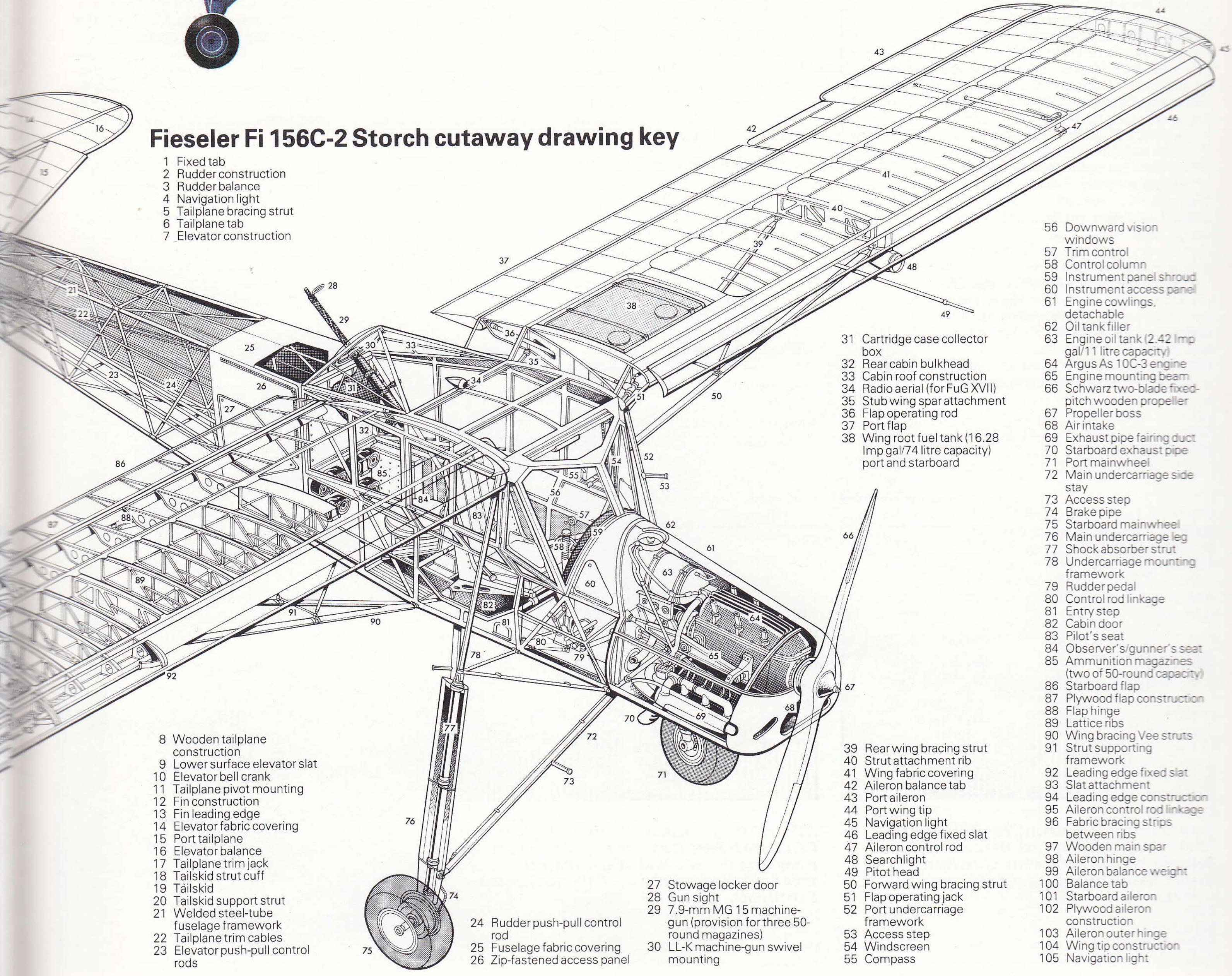


An Fi 156C-3 Storch in the markings of Lehrgeschwader (test wing) 2, but in fact operated by the Kurierstaffel Ob.d.L. (Courier Squadron of the Luftwaffe High Command) on the Don Sector of the Eastern Front during the 1942 drive for the Caucasus.

Such was the excellence of the Storch that many were built in the years after the war both in Czechoslovakia and France, where production had been started by the Germans. This is the Morane-Saulnier MS 500 Criquet (as the French model was called).

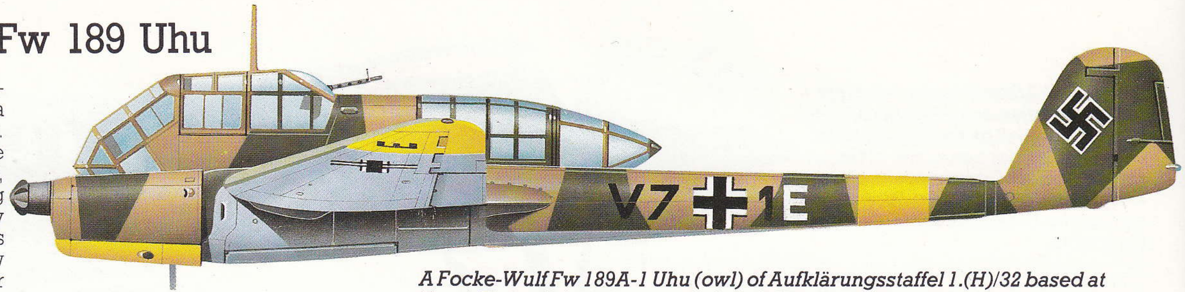


Fieseler Fi 156C-2 Storch cutaway drawing key

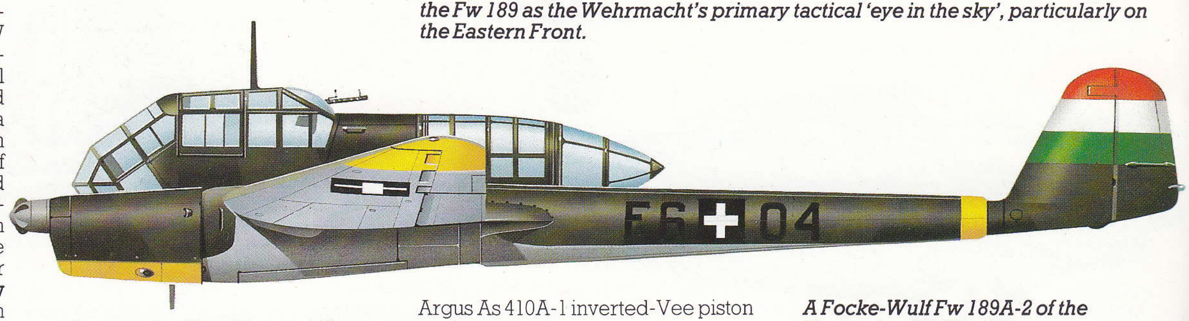
1 Fixed tab
2 Rudder construction
3 Rudder balance
4 Navigation light
5 Tailplane bracing strut
6 Tailplane tab
7 Elevator construction
8 Wooden tailplane construction
9 Lower surface elevator slat
10 Elevator bell crank
11 Tailplane pivot mounting
12 Fin construction
13 Fin leading edge
14 Elevator fabric covering
15 Port tailplane
16 Elevator balance
17 Tailplane trim jack
18 Tailskid strut cuff
19 Tailskid
20 Tailskid support strut
21 Welded steel-tube fuselage framework
22 Tailplane trim cables
23 Elevator push-pull control rods
24 Rudder push-pull control rod
25 Fuselage fabric covering
26 Zip-fastened access panel
27 Stowage locker door
28 Gun sight
29 7.9-mm MG 15 machine-gun (provision for three 50-round magazines)
30 LL-K machine-gun swivel mounting
31 Cartridge case collector box
32 Rear cabin bulkhead
33 Cabin roof construction
34 Radio aerial (for FuG XVII)
35 Stub wing spar attachment
36 Flap operating rod
37 Port flap
38 Wing root fuel tank (16.28 Imp gal/74 litre capacity) port and starboard
39 Rear wing bracing strut
40 Strut attachment rib
41 Wing fabric covering
42 Aileron balance tab
43 Port aileron
44 Port wing tip
45 Navigation light
46 Leading edge fixed slat
47 Aileron control rod
48 Searchlight
49 Pitot head
50 Forward wing bracing strut
51 Flap operating jack
52 Port undercarriage framework
53 Access step
54 Windscreen
55 Compass
56 Downward vision windows
57 Trim control
58 Control column
59 Instrument panel shroud
60 Instrument access panel
61 Engine cowlings, detachable
62 Oil tank filler
63 Engine oil tank (2.42 Imp gal/11 litre capacity)
64 Argus As 10C-3 engine
65 Engine mounting beam
66 Schwarz two-blade fixed-pitch wooden propeller
67 Propeller boss
68 Air intake
69 Exhaust pipe fairing duct
70 Starboard exhaust pipe
71 Port mainwheel
72 Main undercarriage side stay
73 Access step
74 Brake pipe
75 Starboard mainwheel
76 Main undercarriage leg
77 Shock absorber strut
78 Undercarriage mounting framework
79 Rudder pedal
80 Control rod linkage
81 Entry step
82 Cabin door
83 Pilot's seat
84 Observer's/gunner's seat
85 Ammunition magazines (two of 50-round capacity)
86 Starboard flap
87 Plywood flap construction
88 Flap hinge
89 Lattice ribs
90 Wing bracing Vee struts
91 Strut supporting framework
92 Leading edge fixed slat
93 Slat attachment
94 Leading edge construction
95 Aileron control rod linkage
96 Fabric bracing strips between ribs
97 Wooden main spar
98 Aileron hinge
99 Aileron balance weight
100 Balance tab
101 Starboard aileron
102 Plywood aileron construction
103 Aileron outer hinge
104 Wing tip construction
105 Navigation light

GERMANY

Focke-Wulf Fw 189 Uhu



A Focke-Wulf Fw 189A-1 Uhu (owl) of Aufklärungsstaffel 1.(H)/32 based at Kemi, Finland, in the summer of 1942. The later years of the war were to see the Fw 189 as the Wehrmacht's primary tactical 'eye in the sky', particularly on the Eastern Front.



A Focke-Wulf Fw 189A-2 of the Hungarian 3/1 Short Range Reconnaissance Squadron based at Zamocz, Poland, in March 1944. The A-2 model differed from the A-1 solely in having twin MG 81s in the dorsal and tailcone positions.

In February 1937 the Reichsluftfahrtministerium issued a specification for a short-range reconnaissance aircraft. Focke-Wulf responded with the **Focke-Wulf Fw 189 Uhu** (eagle owl), an all metal stressed-skin low-wing monoplane that had an extensively glazed fuselage pod, and twin booms carrying the tail surfaces. The crew nacelle provided accommodation for pilot, navigator/radio operator and engineer/gunner, and power for the prototype was supplied by two 321-kW (430-hp) Argus As 410 engines. Construction of this aircraft began in April 1937, and designer Tank performed the first flight in July 1938. It was a dual-control trainer version which gained the first order in the summer of 1939. These **Fw 189B** aircraft preceded the **Fw 189A** into manufacture and service, some being used as conversion trainers by 9.(H)/LG 2 during the spring and summer of 1940. In a similar manner the construction of 10 **Fw 189A-0** pre-production aircraft began in 1940, some of them being delivered to 9.(H)/LG 2 for operational trials, and being followed by the initial production **Fw 189A-1**. Further developments of this version included the **Fw 189A-1/Trop** which carried desert survival equipment, and the **Fw 189A-1/U2** and **Fw 189A-1/U3** which were equipped as personal transports for the use of Generalfeldmarschall Kesselring and General Jeschonnek respectively. The remaining Fw 189A variants included the **Fw 189A-2** introduced in 1942, which had the trainably mounted MG 15 machine-guns replaced by twin 7.92-mm (0.31-in) MG 81Zs; the **Fw 189A-3** two-seat dual-control trainer which was built in limited numbers; and the light ground-attack **Fw 189A-4** which was armed with two 20-mm MG 151/20 cannon and two 7.92-mm (0.31-in) machine-guns in the wing roots, and had armour protection for the underside of the fuselage, engines and fuel tanks.

Total production of the Fw 189 then amounted to 864 aircraft including prototypes, built not only by Heinkel but also by Aero in Prague from 1940 to 1943, and by SNCASO at Bordeaux-Mérignac until 1944.

Fw 189s were supplied in small numbers to the Slovakian and Hungarian air forces operating on the Eastern Front, in which theatre the type was deployed most extensively by the Luftwaffe, but at least one *Staffel* used the type operationally in North Africa.

Specification

Focke-Wulf Fw 189A-1

Type: two-seat short-range reconnaissance aircraft

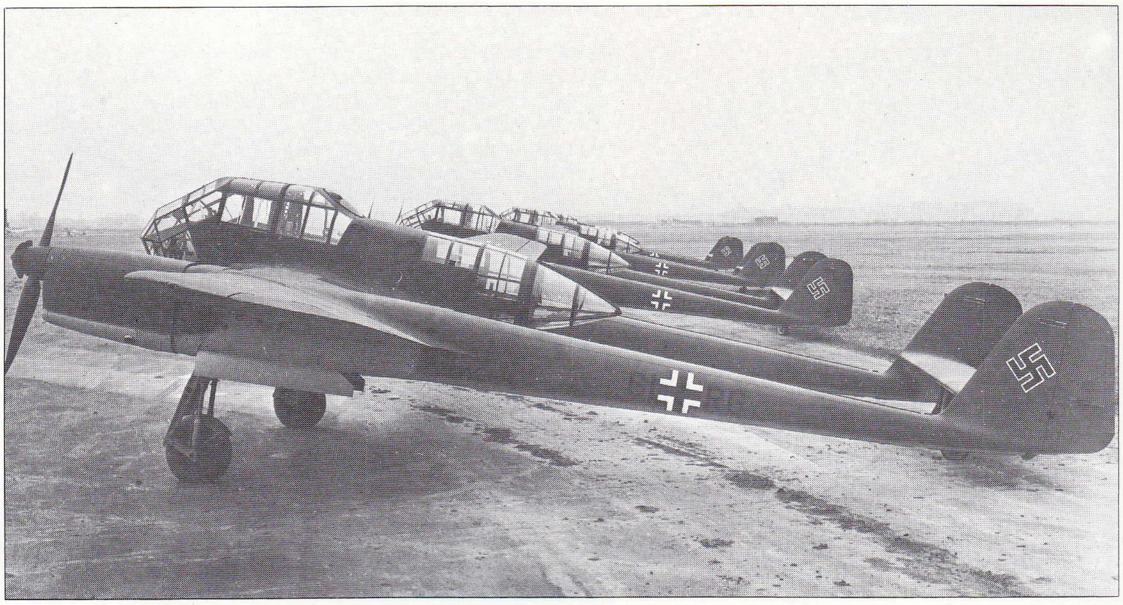
Powerplant: two 347-kW (465-hp) Argus As 410A-1 inverted-Vee piston engines

Performance: maximum speed 335 km/h (208 mph); cruising speed 315 km/h (196 mph); service ceiling 7000 m (22,965 ft); range 670 km (416 miles)

Weights: empty 2805 kg (6,184 lb; maximum take-off 3950 kg (8,708 lb)

Dimensions: span 18.40 m (60 ft 4.4 m); length 12.03 m (39 ft 5.6 in); height 3.10 m (10 ft 2 in); wing area 38.00 m^2 (409.04 sq ft)

Armament: two trainable 7.92-mm (0.31-in) MG 15 machine-guns and two fixed 7.92-mm (0.31-in) MG 17 machine-guns, plus four 50-kg (110-lb) bombs



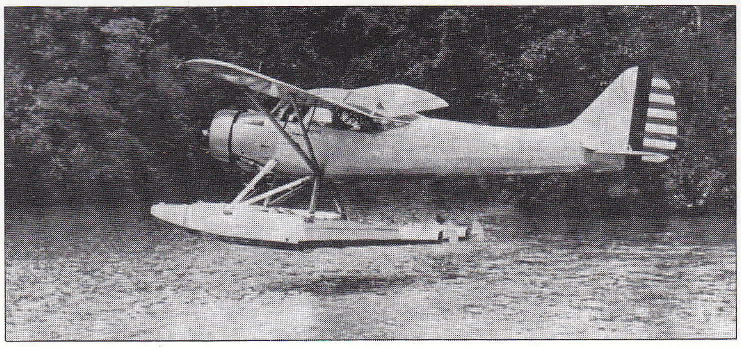
Fw 189A-1s lined up fresh from the factory, awaiting armament. Very tough machines, they handled superbly and some reportedly returned minus one tail boom as a result of ramming attacks by Soviet aircraft.

USA

Stinson L-1 Vigilant

The two-seat light observation aircraft had been an essential adjunct to US Army operations, the concept dating back to World War I. In the years between then and the late 1930s, observation aircraft had, of course, been developed to offer much improved performance, some with high-lift devices which made it possible for them to operate into and out of quite small unprepared areas.

When, in 1940, the US Army Air Corps realized the need to reinforce its aircraft in this category, specifications were circulated and resulted in several contracts. Stinson was awarded a contract for 142 of its design, a braced high-wing monoplane, with an all-metal basic structure, part metal- and part fabric-covered, designated **Stinson O-49**. To provide low-speed and high-lift performance, the whole of the wing leading edge was provided with automatically-operated slats, and the entire trailing edge was



A Stinson O-49F casualty evacuation plane fitted with twin Edo amphibious floats comes in to land. It was re-designated as the L-1 in 1942, when the 'observation' classification was changed to 'liaison'.

occupied by wide-span (almost two-thirds) slotted flaps and large slotted ailerons which drooped 26° when the flaps were fully down. The non-retractable tailwheel landing gear was designed specially for operation from unprepared strips. The powerplant consisted of a 213-kW (285-hp) Lycoming R-680-9 radial engine with a two-blade constant-speed propeller. An enclosed cabin seated two in tandem, and the pilot and observer had an excellent field of view all around, above and below.

A second contract covered the construction of 182 **O-49A** aircraft, which differed by having a slightly longer fuselage and minor equipment changes. Designation changes in 1942 resulted in the O-49 and O-49A becoming the **L-1** and **L-1A** respectively. Both versions were supplied to the RAF under Lend-Lease, and these were given the British name **Vigilant**.

No further production of new Vigilant aircraft followed, for the type was superseded by the more effective lightweight Grasshopper family. Nevertheless, Vigilants saw quite wide use in both the European and Pacific theatres, the RAF operating many of its aircraft for artillery liaison in Italy, Sicily and Tunisia.

Specification

Stinson L-1A

Type: two-seat light liaison/observation aircraft

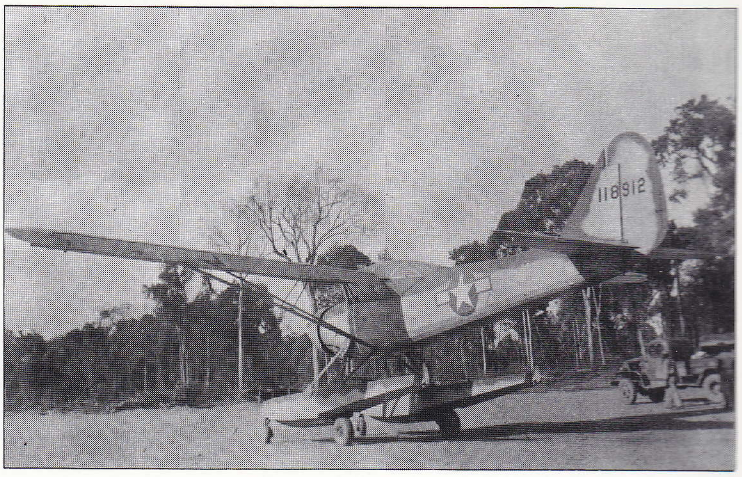
Powerplant: one 220-kW (295-hp) Lycoming R-680-9 radial piston engine

Performance: maximum speed 196 km/h (122 mph); service ceiling 3900 m (12,800 ft); range 451 km (280 miles)

Weights: empty 1211 kg (2,670 lb); maximum take-off 1542 kg (3,400 lb)

Dimensions: span 15.52 m (50 ft 11 in); length 10.44 m (34 ft 3 in); height 3.10 m (10 ft 2 in); wing area 30.56 m^2 (329 sq ft)

Armament: none



A United States Army Air Force L-1F is seen in Burma. Converted from a standard L-1A, it is metallic silver except for the top surfaces, which have been sprayed olive drab.

USA

Taylorcraft L-2 Grasshopper

In 1941 the US Army conducted an operational evaluation with four of each of three types of two-seat light aircraft for use in the artillery spotting and liaison roles, the three types being the **Taylorcraft YO-57**, the Aeronca YO-58 and the Piper YO-59; all were known as Grasshoppers. The successful use of the aircraft during the US Army's manoeuvres, operating directly with ground forces, resulted in increased production contracts for all three, although the Piper design was to be the most prolific.

The first four Taylorcraft YO-57s were standard civil Taylorcraft Model Ds, powered by the 48-kW (65-hp) Continental YO-170-3 flat-four engine, and were followed by 70 basically-similar **O-57** aircraft. However, the need to provide an all-round view resulted in modifications to the cabin and rear fuselage and the introduction of trailing-edge cut-outs at the wing roots. Other alterations to fit the aircraft for its specialized tasks included an observer's seat which could be turned around to face the rear, and the installation of radio. In this form the type was designated **O-57A** and 336 were manufactured.

A further 140 were built under the designation **L-2A**, US Army aircraft of this class having been reclassified, from observation to liaison in 1942. The YO-57s and O-57s were reclassified **L-2** and the YO-57As were redesignated **L-2A**. Some 490 aircraft with special equipment, built for service with the field artillery, were designated **L-2B** and the final variant, with a production run of 900, was the **L-2M**, identified by the fully cowled engine and the fitting of wing spoilers.

Taylorcraft were involved in the training programme of military glider pilots, involving 43 impressed civil machines which were used to provide an initial powered flying course.

The company also developed a light training glider version which was known as the **Taylorcraft ST-100** and given the designation **TG-6**. The front fuselage was extended and a 'glass-house' canopy fitted, the landing gear simplified and a skid added under the nose; the lengthened nose necessitated increased fin area. Production totalled 253, including three for US Navy trials.

Specification

Taylorcraft L-2A

Type: two-seat liaison aircraft/training glider

Powerplant: one 48-kW (65-hp) Continental O-170-3 flat-four piston engine

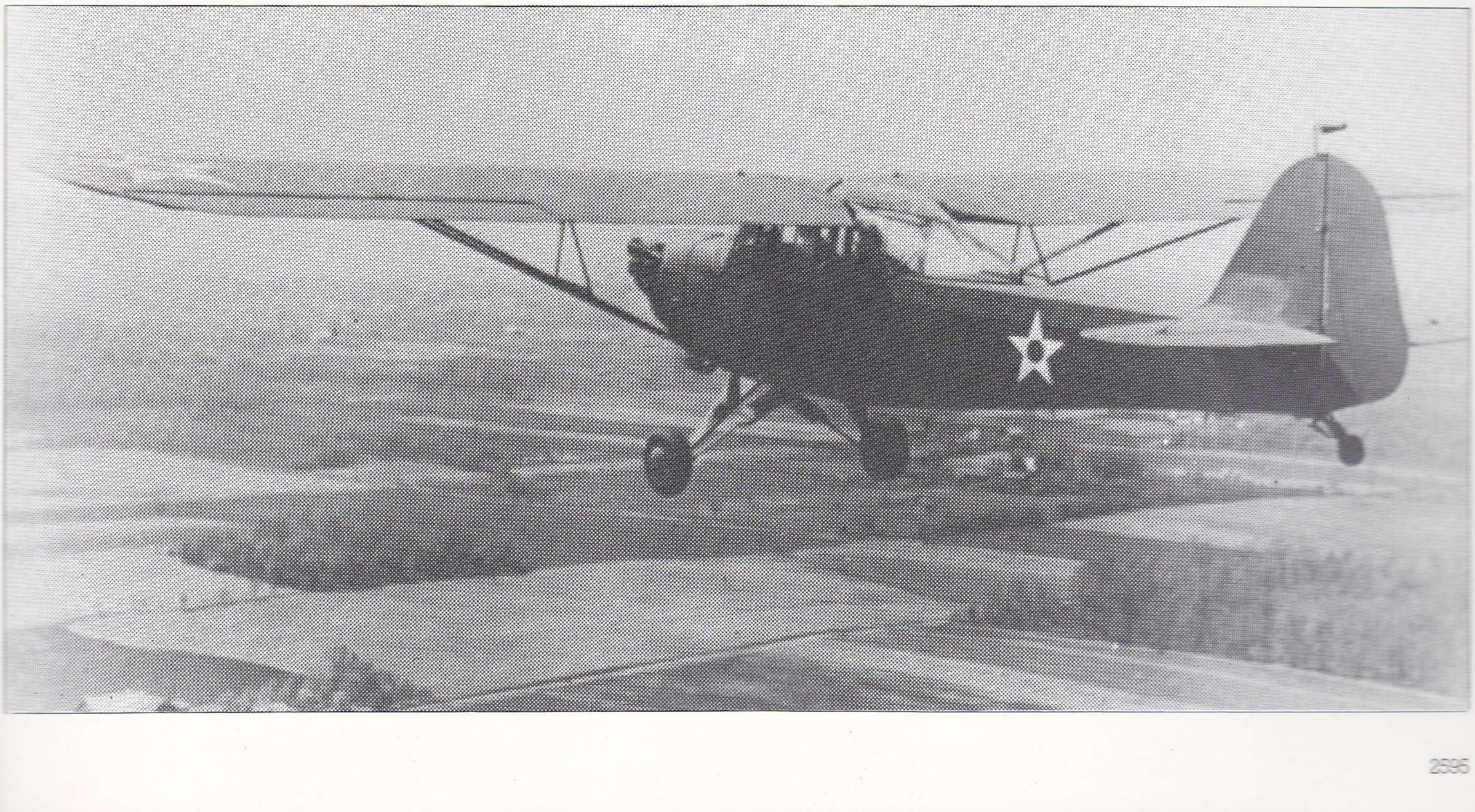
Performance: maximum speed 142 km/h (88 mph); service ceiling 3050 m (10,000 ft); range 370 km (230 miles)

Weights: empty 397 kg (875 lb); maximum take-off 590 kg (1,300 lb)

Dimensions: span 10.79 m (35 ft 5 in); length 6.93 m (22 ft 9 in); height 2.44 m (8 ft 0 in); wing area 16.81 m^2 (181 sq ft)

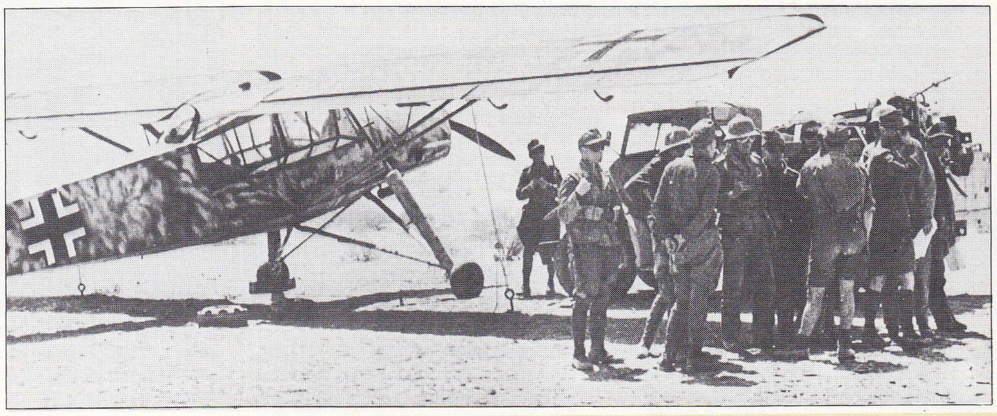
Armament: none

A Taylorcraft L-2A liaison aircraft is seen in 1942. This was a fully militarized version of the civilian Taylorcraft Model D, with improved rear vision and trailing edge cut-outs at the wing roots. The design was the progenitor of the British Auster.



Army Co-operation

The close co-operation of the Luftwaffe with the German army played an important part in the Blitzkrieg victories of 1939-41. By contrast, the RAF had paid little attention to the army, and it was to be several years before air and ground forces fought together successfully.



The campaign in the Western Desert saw the liaison aircraft used to the full, with aircraft such as the Fieseler Storch giving commanders an overall view of the wide expanses of desert and keeping scattered forces in communication with each other.

When the Luftwaffe was reborn in 1934, it was planned first and foremost as a support arm of the German army, all other tasks being either means to that end or deliberately subordinated to it. In other words, almost all the combat aircraft planned for the Luftwaffe's inventory would to some extent be employed in 'army co-operation'. The UK's air force, on the other hand, was a totally autonomous service and performed a much greater range of tasks of which the 'army co-operation' role was considered to be of relatively minor importance, being confined to gunnery spotting, short-range reconnaissance and battle area surveillance; the ground-attack fighter-bomber, for instance, was unimagined. World War II changed all that.

The only aeroplane which, by the nature of its operational requirement, the RAF employed as a matter of course over the battlefield at the beginning of the war was the Westland Lysander, the Fairey Battle and Bristol Blenheim light bombers operating somewhat farther afield. The Germans by contrast flew large numbers of Henschel Hs 126s, aircraft of concept very similar to that of the Lysander and operated in much the same manner; yet this was only a part of the apparatus of *Blitzkrieg*, and it operated successfully in an environment of German air superiority won by the Messerschmitt, Junkers and Heinkels over the land battle.

Both sides took stock of the lessons learned in the first year of the war, however, and the RAF in particular realized that the business of army co-operation had to be upgraded (and quickly) if the British army was to survive further onslaughts by *Blitzkrieg* tactics. The Lysander had been required to spot for the army and drop bombs over the battlefield in skies dominated by modern fighters, and had suffered accordingly. And so the fighter-bomber was conceived as a bomb-carrying adaptation of the interceptor which could also dispute air superiority over the land battle. Indeed the Luftwaffe had begun this process in Spain, and took it much further with its bomb-carrying Messerschmitt Bf 109s and Bf 110s in 1940.

This divestment of the combat role by the traditional 'army co-operation' aeroplane now rendered obsolescent aircraft like the Lysander and Hs 126, both of them relatively large. Such machines were by no means rudimentary and had never been capable of being operated from what today would be termed 'dispersed sites'. What was needed instead was an aircraft capable of the same short-field performance, much simpler to fly and maintain in the field, and yet able to perform the same battlefield tasks as hitherto.

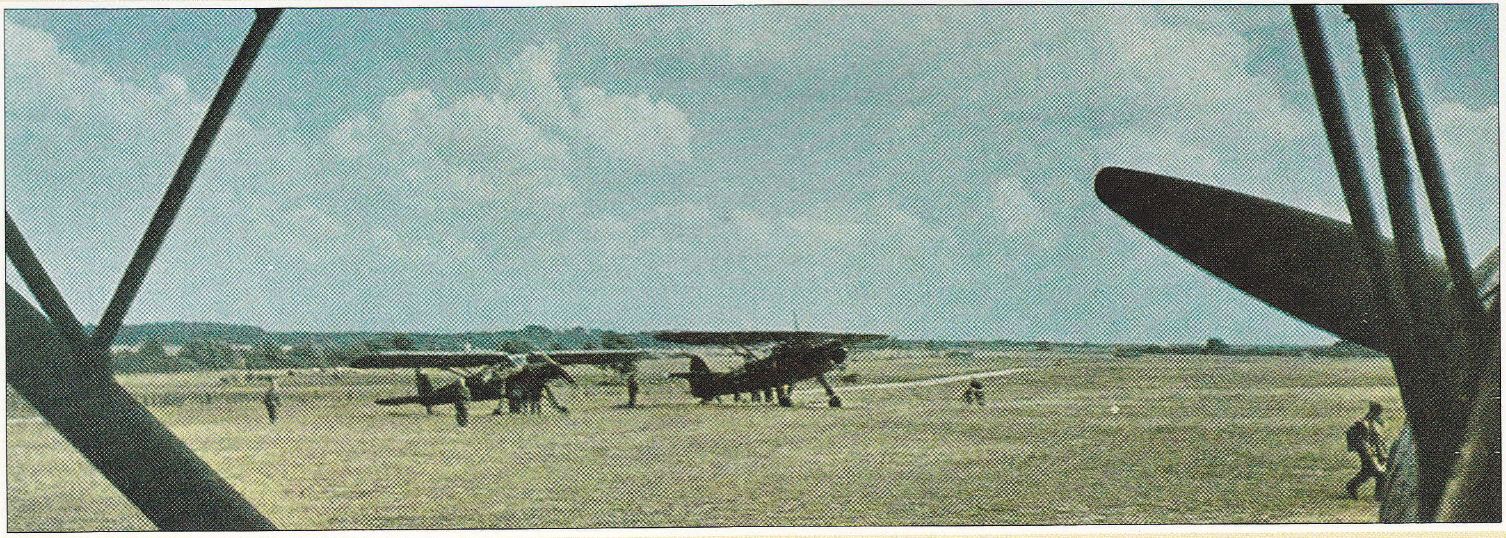
Communications duties

The Luftwaffe of course already possessed such an aircraft in the superb Fieseler Storch, although it had thus far been used more as an 'aerial staff car' for communications behind the battlefront than for operational duties, but from 1940 onwards this light aircraft came to be employed for such tasks as artillery spotting, short-range reconnaissance, casualty evacuation and aircrew recovery, delivery of sabotage teams and recovery of agents from behind enemy lines. It was of course no less vulnerable to fighters and ground fire but, being more manoeuvrable and simpler to fly, it stood a much better chance of surviving a forced landing. Its modern counterpart is the helicopter.

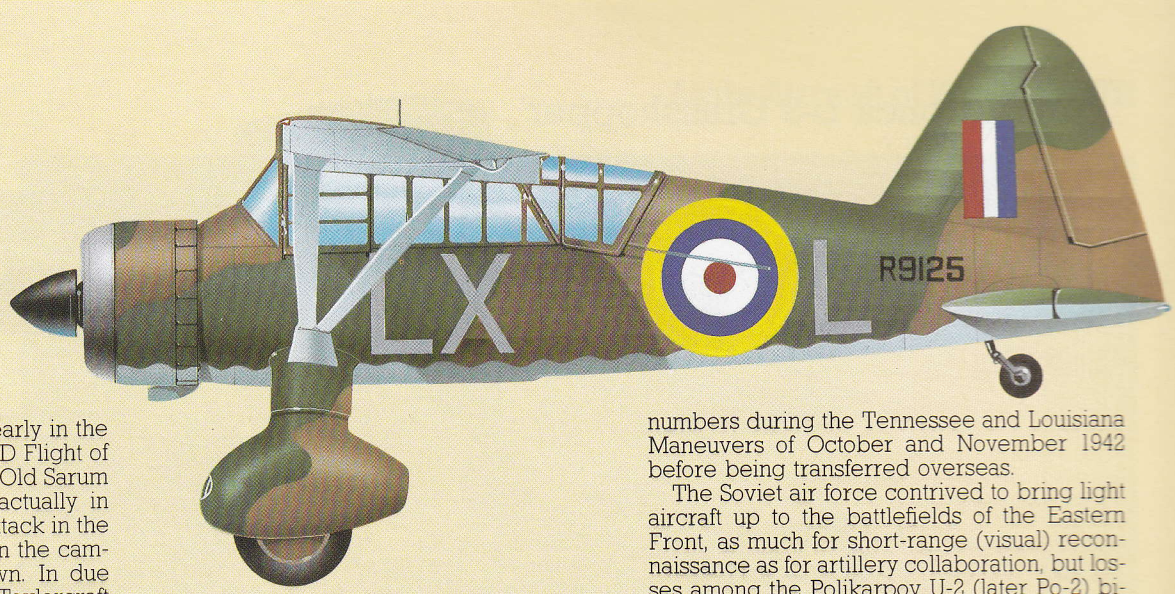
The RAF took rather longer to formulate its requirements for the battlefield, other than producing bomb- and rocket-carrying fighters, and the Lysander soldiered on in its traditional role in the Mediterranean. At home it came to be employed for a very different purpose, that of delivering agents to and from occupied Europe. But following its massacre in the Battle of France during 1940, it was firmly withdrawn from operational army co-operation.

As the old Lysander squadrons (still known as army co-operation units) converted to such aircraft as the Curtiss Tomahawk and North American Mustang reconnaissance fighters, which did not prove entirely suitable for work at low level, a new generation of army co-operation units came into being in 1941, the air observation posts (AOP), staffed jointly by RAF and army personnel.

Trials using a Taylorcraft Model D (a British-built version of the American sporting light-



On a field in Greece two types of German aircraft make an interesting contrast, the larger Henschel being typical of the pre-war thinking on army co-operation and the Storch typifying the light 'L' liaison plane that was ultimately to prove more useful.



The Westland Lysander went to France in 1940, with the RAF expecting to use it in the direct support of the ground forces. Within four years, its tasks were to be taken by very different types, including the light plane and the high-performance fighter.

plane) with the School of Artillery early in the war had resulted in the creation of D Flight of the School of Army Co-operation at Old Sarum in February 1940; this flight was actually in France at the time of the German attack in the West on 10 May, but took no part in the campaign and was hurriedly withdrawn. In due course the Air Ministry ordered 100 Taylorcraft Plus Ds (named the Auster Mk I) and these eventually served with D Flight, proving to be excellent *ab initio* trainers for Royal Artillery officers who could be given only the rudiments of flying training.

On 1 August 1941 No. 651 (Air Observation Post) Squadron was formed at Old Sarum. During the next 12 months four more AOP squadrons were formed and two of these, Nos 651 and 654, accompanied the British 1st Army in the 'Torch' landings in North Africa in November 1942. Other squadrons were formed subsequently, working with British land forces during the Sicilian and Italian campaigns, the Normandy landings and the reconquest of northern Europe. No. 656 Squadron, with Auster Mk IIIs, embarked for India in August 1943 and supported the 14th Army in Burma from January 1944 until the end of the war.

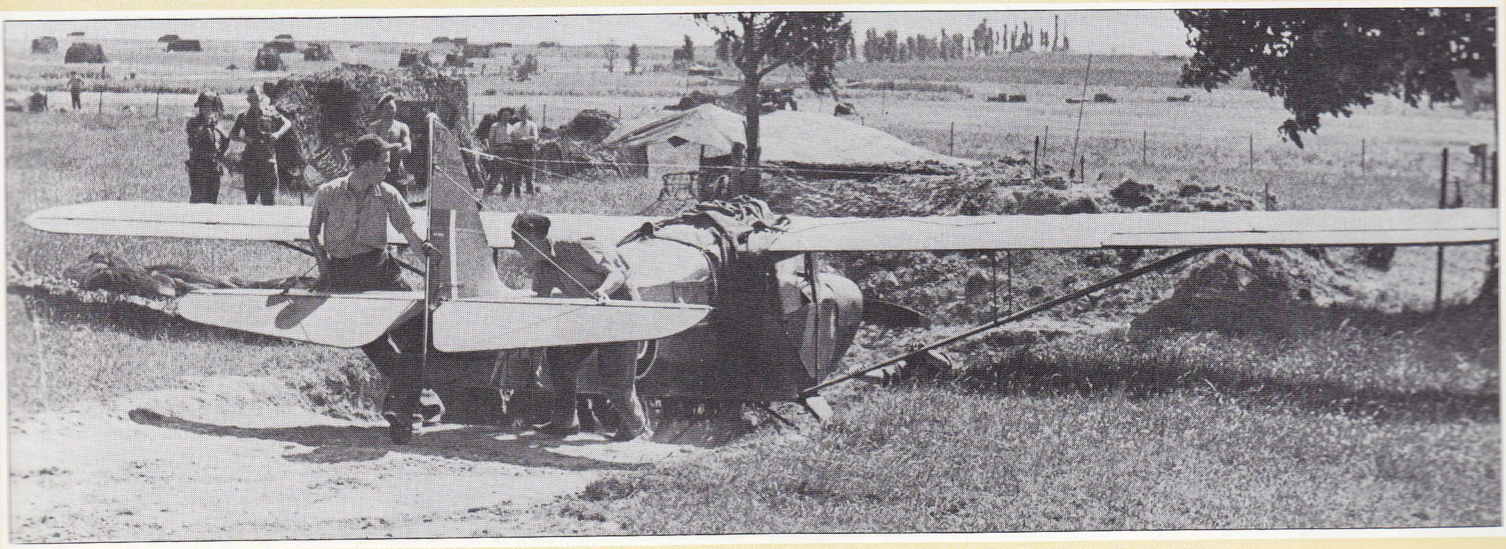
Army co-operation in the American air forces had also been long established, dating as far back as 1919 with the creation of the Army Surveillance and Army Observation Groups of July-October that year, flying DH.4B and DH.4M aircraft. Gradually the 'Observation Force' expanded with such aircraft as the Curtiss Falcon and Douglas O-series aircraft during the years of peace until, on the eve of the USA's entry into World War II, the US Army Air Corps possessed eight observation groups with a total of 26 squadrons, equipped with a heterogeneous collection of Douglas O-38s and O-46s and North American O-47s; of these squadrons 21 belonged to the Air National Guard.

Some weeks before Pearl Harbor the first of a series of large-scale training exercises (the Carolina Maneuvers involving infantry, armoured and artillery units of the US Army, as well as nine observation squadrons) was held, the conduct of which determined the future course of US Army Air Corps co-operation with the ground forces, much along the same lines as current thinking in Europe. Bombing and strafing would henceforth be undertaken by fighters and light bombers, while artillery spotting, short-range reconnaissance and similar tasks would be carried out by a new class of lightplane, often referred to as Grasshoppers. The first of these, the Stinson L-1 Vigilant, had already flown as the O-49 but was now regarded as being still too large and heavy, and was soon overtaken by the Aeronco L-3, Piper L-4 and Stinson L-5, aircraft whose all-up weights ranged between 590 kg (1,300 lb) and 907 kg (2,000 lb), compared with the 1542 kg (3,400 lb) of the L-1 (and almost 2722 kg/ 6,000 lb of the Lysander).

Within three years of the USA's entry into the war the USAAF fielded no fewer than 13 groups (with the equivalent of 47 squadrons), their Grasshoppers performing such battlefield tasks as 'artillery adjustment', weather reconnaissance, bomb/barrage-damage assessment, despatch carrying, casualty evacuation and photographic mapping. While several of these groups remained in the USA for training and replacement purposes, others (now simply termed reconnaissance groups) accompanied US armies overseas to the South West Pacific, North Africa and Europe. The Grasshoppers were first deployed in large numbers during the Tennessee and Louisiana Maneuvers of October and November 1942 before being transferred overseas.

The Soviet air force contrived to bring light aircraft up to the battlefields of the Eastern Front, as much for short-range (visual) reconnaissance as for artillery collaboration, but losses among the Polikarpov U-2 (later Po-2) biplanes, which were also frequently used to broadcast propaganda with loudspeakers to the German troops, were astronomical in the face of early Luftwaffe air superiority; these aircraft were also widely used for night nuisance raids over the German lines. Later, as the Luftwaffe was forced by fuel shortages to abandon patrols to rid the skies over the battlefield of these small aircraft, they were able to operate with impunity, and were still very much in evidence right up to the end of the war in Europe.

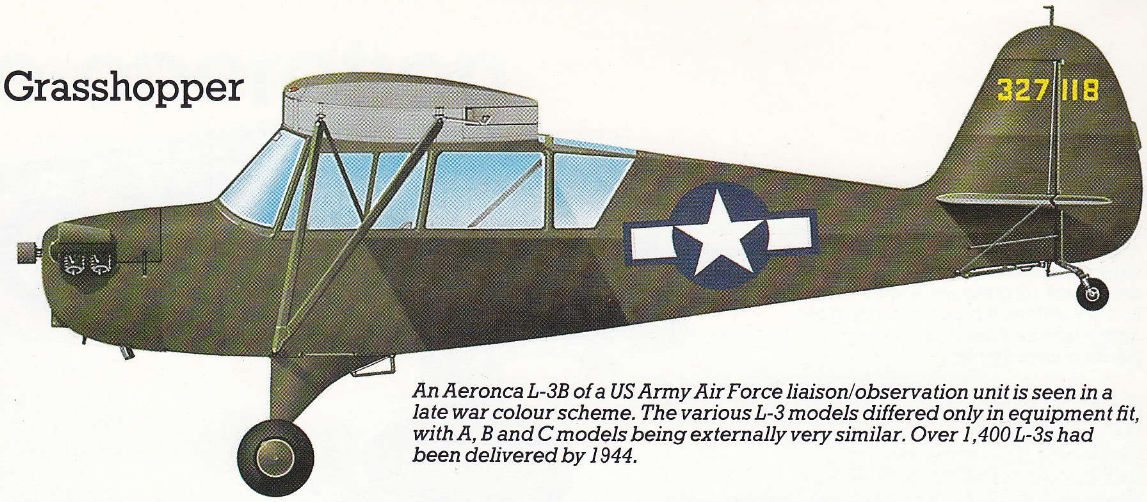
Perhaps the most sustained Allied use of artillery spotting aircraft was during the advance through northern Europe following the Normandy landings, a total of 11 USAAF and 10 RAF squadrons (Nos 652, 653, 657, 658, 659, 660, 661, 662, 664 and 665) supporting the US, British and Canadian armies. During the landings the Austers and Grasshoppers were flown from special carriers to direct gunfire on the landing areas. By way of testimony to their value during that final victorious campaign it is worth quoting a passage from the records of the 10th Panzer Division: 'The greatest nuisance of all are the slow-flying artillery spotters which work with utter calmness over our positions, just out of reach, and direct artillery fire on our forward positions.'



An Auster IV of the 652nd Air Observation Squadron attached to the 3rd Canadian Infantry Division of I British Corps is wheeled out of a blast pit near Cresserons during the Normandy campaign. Such aircraft provided valuable information to the Allies.

USA

Aeronca L-3 Grasshopper



An Aeronca L-3B of a US Army Air Force liaison/observation unit is seen in a late war colour scheme. The various L-3 models differed only in equipment fit, with A, B and C models being externally very similar. Over 1,400 L-3s had been delivered by 1944.

The name Aeronca Aircraft Corporation had been adopted in 1941 by the company established in late 1928 as the Aeronautical Corporation of America. One of its most successful products was the **Aeronca Model 65** highwing monoplane, developed to meet commercial requirements for a reliable dual-control tandem two-seat trainer. The four of these aircraft supplied initially to the USAAC became designated **YO-58**, and these were followed by 50 **O-58**, 20 **O-58A** and 335 **O-58B** aircraft, serving with the USAAF (established on 20 June 1941). In the following year the O (Observation) designation was changed to L (Liaison), and the O-58, O-58A and O-58B designations became respectively **L-3, L-3A** and **L-3B Grasshopper**. An additional 540 aircraft were delivered as L-3Bs and 490 **L-3C** aircraft were manufactured before production ended in 1944. The designations **L-3D/-3E/-3F/-3G/-3H/-3J** were applied to civil Model 65s with varying powerplant installations and impressed into military service when the United States became involved in World War II.

Most L-3s were generally similar, with small changes in equipment representing the variation from one to another. All shared the welded steel-tube fuselage/tail unit with fabric covering, and wings with spruce spars, light alloy ribs and metal frame ailerons, all fabric-covered. Landing gear was of non-retractable tailwheel type, with the main units divided and incorporating oleo-spring shock-absorbers in the side vees.

With the requirement for a trainer suitable for glider pilots, Aeronca developed an unpowered version of the Model 65. This retained the wings, tail unit and aft fuselage of the L-3, but introduced a new front fuselage providing a third seat forward for an instructor, the original tandem seats being used by two pupils: all three occupants had similar flying controls and instruments. A total of 250 of these training gliders was supplied to the USAAF under the designation **TG-5**, and three supplied to the US Navy for evaluation were identified as **LNR**. Production of Aeronca liaison aircraft continued after the war, with planes supplied to the USAF under the designation **L-16**.

Specification

Aeronca L-3

Type: two-seat light liaison and observation monoplane

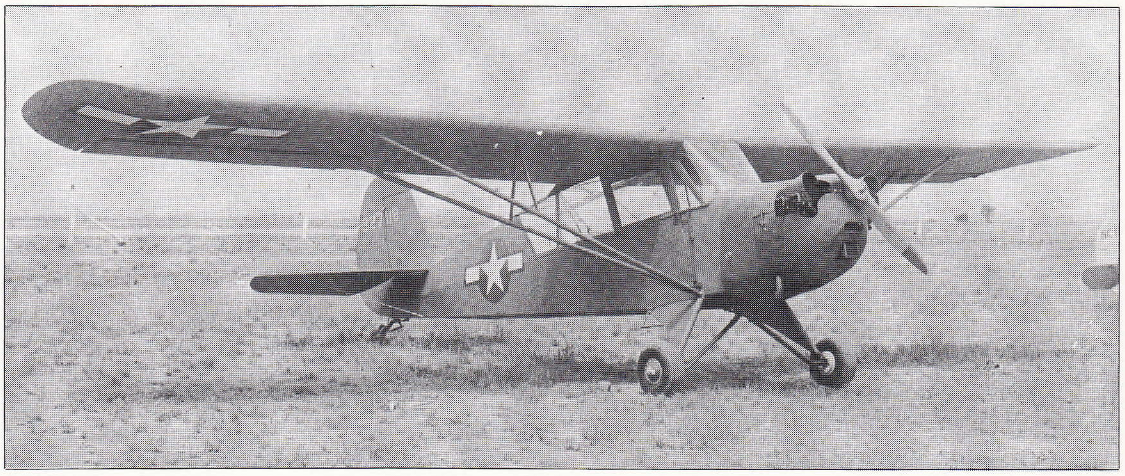
Powerplant: one 48-kW (65-hp) Continental O-170 flat-four piston engine

Performance: maximum speed 140 km/h (87 mph); cruising speed 74 km/h (46 mph); service ceiling 3050 m (10,000 ft); range 322 km (200 miles)

Weights: empty 379 kg (835 lb); maximum take-off 590 kg (1,300 lb)

Dimensions: span 10.67 m (35 ft 0 in); length 6.40 m (21 ft 0 in); height 2.34 m (7 ft 8 in); wing area 14.68 m^2 (158 sq ft)

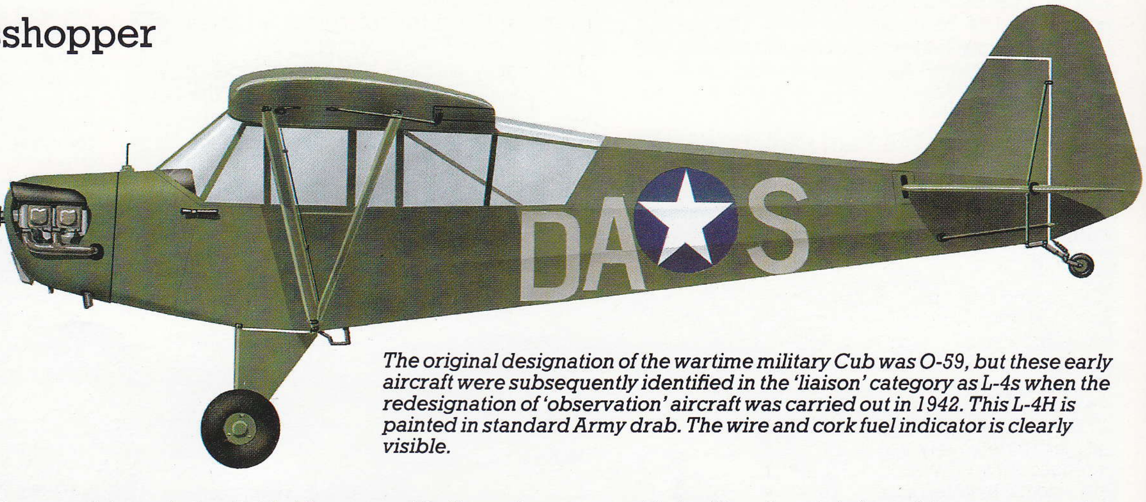
Armament: none



An Aeronca L-3C is seen during the last months of the war. Together with the Taylorcraft and Piper models of the Grasshopper, the L-3C was powered by a 65-hp 0-170-3 Continental piston engine.

USA

Piper L-4 Grasshopper



The original designation of the wartime military Cub was O-59, but these early aircraft were subsequently identified in the 'liaison' category as L-4s when the redesignation of 'observation' aircraft was carried out in 1942. This L-4H is painted in standard Army drab. The wire and cork fuel indicator is clearly visible.

Evaluated for the role of artillery spotting and front-line liaison, four examples of the **Piper Cub Model J-3C-65** were acquired for this purpose by the US Army Air Corps in mid-1941. These were allocated the designation **YO-59** and, almost simultaneously, 40 additional examples were ordered as **O-59** aircraft.

Experience on manoeuvres made it possible to procure a new version more specifically tailored to the US Army's requirements. This, designated **O-59A**, was of braced high-wing monoplane configuration and was of composite construction comprising wooden spars, light alloy ribs and fabric covering. The fuselage and braced tail unit had basic structures of welded steel tube and were fabric-covered. Landing gear was of the fixed tailwheel type, and the powerplant of the O-59A comprised a 48-kW (65-hp) Continental O-170-3 flat-four engine. Primary requirement of the O-59A specification was improved accommodation for pilot and observer, which was achieved with a modified enclosure for the tandem cockpits to provide better all-round visibility. The type was later redesignated **L-4A**.

In 1942 Piper was requested to develop a training glider from the basic L-4 design, this involving the removal of the powerplant and landing gear. In its modified form it had a simple cross-axle landing gear with hydraulic brakes, and the powerplant was replaced by a new front fuselage to accommodate an instructor, and he and both pupils were provided with full flying controls. A total of 250 was built for the USAAF under the designation **TG-8**, plus three for evaluation by the US Navy which designated them **XLNP-1**.

Apart from the three XLNP-1s which the US Navy acquired for evaluation, this service also procured 230 **NE-1** aircraft basically similar to the US Army's L-4s, and these were used as primary trainers. Twenty similar aircraft procured at a later date were designated **NE-2**, and 100 examples of the **Piper J-5C Cub** which were acquired for ambulance use (carrying one stretcher) were originally **HE-1**. When, in 1943, the letter H was allocated to identify helicopters, the HE-1s were redesignated **AE-1**.

Specification
Piper L-4
Type: two-seat lightweight liaison aircraft
Powerplant: one 48-kW (65-hp) Continental O-170-3 flat-four piston engine
Performance: maximum speed 137 km/h (85 mph); cruising speed 121 km/h (75 mph); service ceiling 2835 m (9,300 ft); range 306 km (190 miles)
Weights: empty 331 kg (730 lb); maximum take-off 553 kg (1,220 lb)
Dimensions: span 10.74 m (35 ft 3 in); length 6.71 m (22 ft 0 in); height 2.03 m (6 ft 8 in); wing area 16.63 m^2 (179 sq ft)
Armament: none

The Piper Cub was built in improved versions up until 1981, and has been used by a great many air forces. The Israeli air force, operators of this late-model Super Cub, have been using the type since its creation in the late 1940s.

USA

Stinson L-5 Sentinel

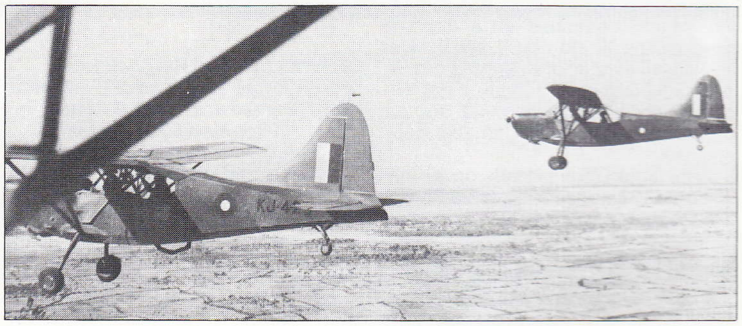
The **Stinson** (part of Vultee) **105 Voyager** was an attractive three-seat civil lightplane, and in 1941 the US Army acquired six of these civil aircraft which it evaluated for use in a light liaison role. Successful testing resulted in an initial order of 1941 for 275 aircraft to be powered by the Lycoming O-435-1 flat-four engine. The following order covered 1,456 similar aircraft, under the designation **L-5**.

Construction of the L-5s was changed from that of the original Voyager design following a decision to reserve alloy materials for the construction of combat aircraft. Instead of the mixed construction which had been used for the wing and tail unit of the Voyager, those of the L-5 were all-wood, but retained the welded steel-tube fuselage structure. Other changes included rearrangement of the enclosed cabin to seat two in tandem, a reduction in height of the rear fuselage to provide an improved rearward view, and the provision of clear transparent panels in the roof. The original wing design had included leading-edge slots and slotted trailing-edge flaps, and these were retained. The main units of the non-retractable tailwheel type landing gear were modified so that the stroke of the oleo-spring shock-absorbers was almost doubled.

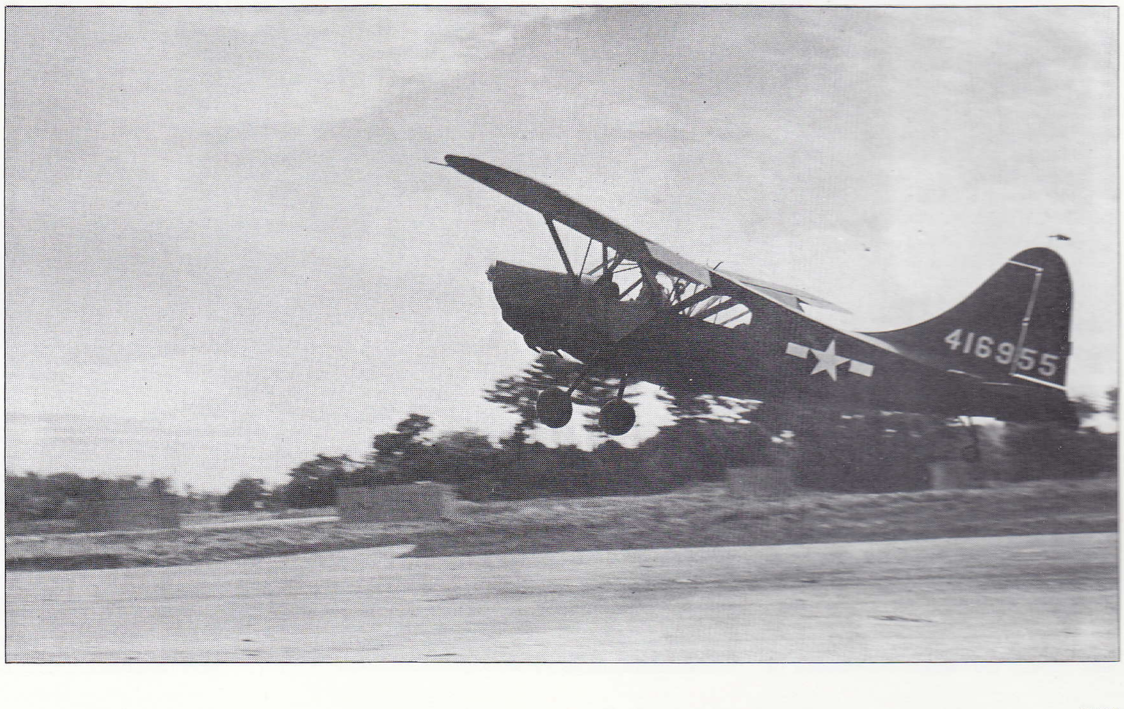
The L-5C, of which 200 were built, had provision for the installation of a K-20 reconnaissance camera. In addition to the aircraft procured directly by the US Army, eight commercial Voyagers were commandeered in 1941 and designated **AT-19A** (later **L-9A**), and 12 others as **AT-19B** (**L-9B**).

Used extensively by the USAAF throughout World War II, especially in the Pacific theatre, many L-5s were still in use to provide valuable service during the Korean War. The RAF was allocated 100 of these aircraft under Lend-Lease, and these were used widely in Burma for liaison spotting and air ambulance duties under the name **Sentinel**. The US Marine Corps acquired a total of 306 L-5s of differing versions, but all were designated **OY-1**, the Y signifying origin from Consolidated after a merger with Vultee in early 1943. The US Marine Corps deployed its Sentinels for similar missions to those of the RAF and USAAF in support of its operations in the Pacific.

Specification
Stinson L-5
Type: two-seat light liaison aircraft
Powerplant: one 138-kW (185-hp) Lycoming O-435-1 flat-four piston engine
Performance: maximum speed 209 km/h (130 mph); service ceiling 4815 m (15,800 ft); range 676 km (420 miles)
Weights: empty 703 kg (1,550 lb); maximum take-off 916 kg (2,020 lb)
Dimensions: span 10.36 m (34 ft 0 in); length 7.34 m (24 ft 1 in); height 2.41 m (7 ft 11 in); wing area 14.40 m^2 (155 sq ft)
Armament: none



***Above:** Two of the 100 Stinson Sentinels supplied under Lend-Lease to the RAF in Burma fly over the paddy fields. They were used for artillery spotting, air ambulance and general liaison duties.*



Developed from the Stinson 105 Voyager, the L-5 Sentinel was used extensively by the USAAF, especially in the Pacific. This example is from the 163rd Liaison Squadron, based on Okinawa in the middle of 1945.

USSR

Polikarpov U-2

Occupying a unique position in Soviet aviation history, the **Polikarpov U-2** primary trainer biplane had an inauspicious start. The **U-2TPK** prototype, which appeared in early 1927, had been built to achieve economy in repair and maintenance, the wings comprising four identical thick-section interchangeable rectangular panels with square tips. Similarly, a common control surface was used for ailerons, elevators and rudder. The result was a biplane with very poor flight characteristics. It had thus to be redesigned, appearing as a neat, manoeuvrable biplane having staggered single-bay wing with rounded tips, conventional cross-axle landing gear, and tandem open cockpits for instructor and pupil. Powered by a 75-kW (100-hp) radial engine, the new prototype made its first flight on 7 January 1928. An immediate success, it was placed in quantity production, deliveries starting in 1928, and by the time of the German invasion of the Soviet Union in mid-1941 over 13,000 had been completed.

Though its principle role was primary training, the U-2 was soon modified as a light passenger transport, air ambulance and agricultural aircraft. Production continued on a massive scale during World War II, and the U-2 took on an even wider range of duties, including liaison, light attack, night nuisance raider and propaganda aircraft complete with microphone and loudspeaker.

After Polikarpov's death, on 30 July 1944, the U-2 was redesignated **Po-2** in his honour, and post-war it continued in production in the USSR for several years. Trainer and ambulance variants were built on a large scale in Poland from 1948 to 1953. Po-2s served with many Soviet allies and a small number still remain in flying condition in the USSR and several other countries. The total built is credibly reported to be in excess of 40,000.

Specification

Polikarpov U-2VS

Type: trainer and multi-purpose aircraft

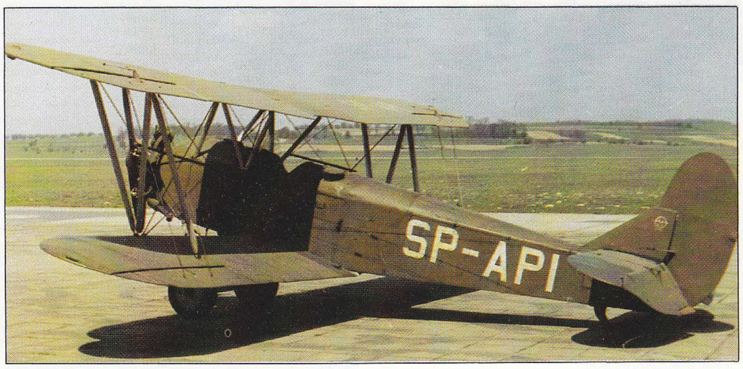
Powerplant: one 75-kW (100-hp) M-11 radial piston engine

Performance: maximum speed 156 km/h (97 mph); service ceiling 4000 m (13,125 ft); range 400 km (249 miles)

Weights: empty equipped 635 kg (1,400 lb); maximum take-off 890 kg (1,962 lb)

Dimensions: span 11.40 m (37 ft 4.8 in); length 8.17 m (26 ft 9.78 in); height 3.10 m (10 ft 2 in); wing area 33.15 m^2 (356.84 sq ft)

Armament: none



Built on a large scale in Poland as the CSS-13, the Polikarpov U-2 (known as the Po-2 after the designer's death in 1944) was used in a wide array of both civil and military roles, and has probably been built in greater numbers and in more variants than any other aircraft in history.

A Soviet built U-2 supplied to the Polish forces at the end of World War II, preserved at a Polish museum. Over 100 regiments, each of 42 aircraft, operated the 'Kuburuznile' ('Corn Cutter') at the height of the war.

ITALY

Meridionali Ro.37bis

Meridionali, then named Officine Ferroviarie Meridionali, first became involved in the Italian aircraft industry in 1923, beginning manufacturing activities two years later by licence-construction of Fokker designs. Subsequently, after two years under the name Romeo, the title Industrie Meccaniche e Aeronautiche Meridionali (IMAM) was adopted in 1936.

In 1934 the company had started design and production of a two-seat fighter/reconnaissance biplane under the designation **Romeo Ro.37**. This was an unequal-span single-bay biplane of mixed wood and metal construction. Its design included fixed tailwheel landing gear, all three wheels being provided with speed fairings; a braced tail unit incorporating a variable-incidence tailplane; and accommodation for two in tandem enclosed cockpits. Power was provided by a 522-kW (700-hp) Fiat A.30RA Vee engine. An improved **Ro.37bis** was developed subsequently, and this introduced an optional radial powerplant comprising either the Piaggio P.IX or P.X supercharged engine. Both models proved popular for their day, with production of the Ro.37 and Ro.37bis exceeding 160 and 475 respectively, and export orders were received from Afghanistan, Hungary and from countries in Central and South America.

Ro.37 and Ro.37bis aircraft were involved in the Spanish Civil War from October 1936 and were used extensively by the Regia Aeronautica during Mussolini's invasion of Abyssinia between October 1935 and May 1936 and during the Italian occupation of that country until 1941. Some 275 Ro.37bis aircraft were in service with the Regia Aeronautica when Italy became involved in World War II, and these saw first-line service in the East and North African campaigns and in the Balkans. After withdrawal from first-line service they found a variety of uses, but all had been retired before Italy's armistice with the Allies on 8 September 1943.

Specification

Meridionali Ro.37bis

Type: two-seat fighter/reconnaissance aircraft

Powerplant: one 418-kW (560-hp) Piaggio P.IX RC.40 radial piston engine

Performance: maximum speed 330 km/h (205 mph) at 5000 m (16,405 ft); cruising speed 250 km/h (155 mph); service ceiling 7200 m (23,620 ft); maximum range 1120 km (696 miles)

Weights: empty 1585 kg (3,494 lb); maximum take-off 2420 kg (5,335 lb)

Dimensions: span 11.08 m (36 ft 4.2 in); length 8.56 m (28 ft 1 in); height 3.15 m (10 ft 4 in); wing area 31.35 m^2 (337.46 sq ft)

Armament: two fixed forward-firing 7.7-mm (0.303-in) machine-guns and one gun of same calibre on trainable mount in rear cockpit, plus up to 180 kg (397 lb) of bombs on underfuselage racks

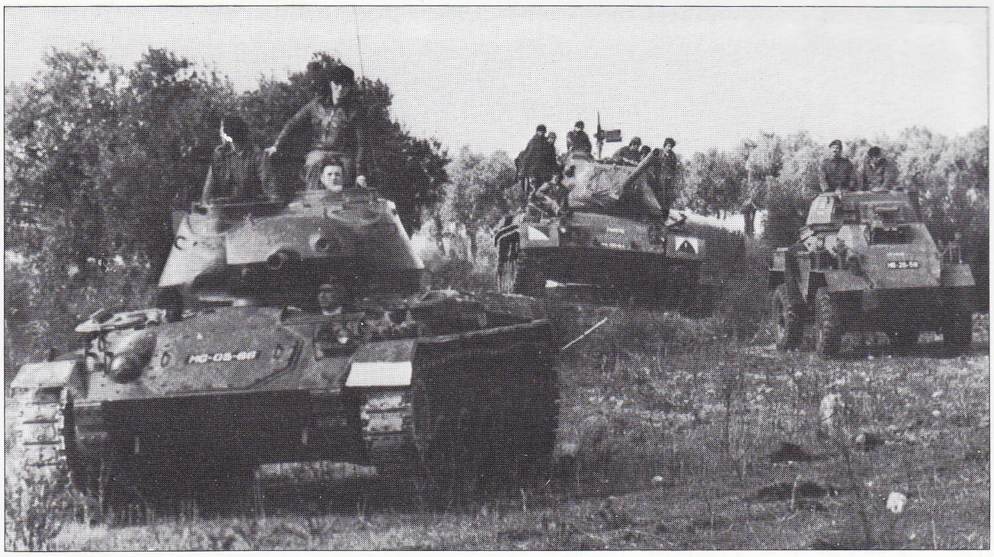
The Meridionali Ro.37 saw its heyday during the Spanish Civil War. A few soldiered on into World War II, this example being captured during the battle for Monte Corvino near Salerno in 1943.

Portugal

Until very recently Portugal was a colonial power with troops stationed overseas in Angola, Guinea, Timor and Mozambique. Today the armed forces have only two main functions, first as a member of the North Atlantic Treaty Organization which the country joined in 1949, and second as a counter-insurgency/internal security service. The strength of the Portuguese armed forces reached a peak in 1974, when they totalled 282,000 officers and men and defence expenditure accounted for 7.4 per cent of the gross domestic product (GDP). With the withdrawal from the colonies the total strength was rapidly reduced, and today the Portuguese armed forces total about 64,000 officers and men with defence expenditure accounting for around 4 per cent of the gross domestic product (GDP).

For many years the Portuguese armed forces were starved of modern equipment as most of the money went on equipment suitable for use in the counter-insurgency and internal security role, especially infantry weapons such as rifles, machine-guns and mortars.

In the last few years some modern equipment has started to arrive in Portugal, much of it from other NATO countries including West Germany, the UK and the United States. There is so much obsolete equipment still in service, especially with the army and air force, that it will be many years, if at all, before the Portuguese armed forces can be considered a potent force by NATO standards.



An interesting collection of armoured vehicles belonging to a regiment which stayed loyal during the 1975 coup attempt advancing on Lisbon. From left to right: an M24 Chaffee, an M47 Main Battle Tank and a World War II vintage Humber armoured car.

The army

The army has a total strength of 40,000 officers and men, of whom 30,000 are conscripts. This force is organized into six territorial commands, of which four are within Portugal itself and the other two are island commands.

Portuguese infantry armed with 7.62-mm (0.3-in) G3 rifles stand in the rain during a disturbance in the capital. The 1974 coup ousted the Salazar dictatorship and ended the bloody wars in Angola and Mozambique that were such a drain on resources.

Units include one mixed brigade, three cavalry regiments, 11 infantry regiments, three independent infantry battalions, one commando regiment, one anti-aircraft regiment, two field artillery regiments, one coastal artillery regiment, two engineer regiments, one signals regiment, one military police regiment, and special forces.

Most of the modern equipment is issued to the 1st Independent Mixed Brigade, which is earmarked for NATO deployment. This brigade consists of one tank battalion, one mechanized infantry battalion, two infantry battalions, and one artillery battalion with M109 self-propelled howitzers.

The tank battalion has one company of M48A5s with 105-mm (4.13-in) gun, two companies of M47s with 90-mm (3.54-in) guns, and a reconnaissance company with M48A5 tanks, M113A1/M113A2 armoured personnel carriers (including some with the Hughes TOW ATGW system) and M106A2 mortar carriers with 107-mm (4.2-in) mortars.

Equipment includes 27 M47 tanks, 23 M48A5 tanks from West Germany and the United States, 11 M24 Chaffee light tanks, 43 Panhard EBR heavy armoured cars and EBR-ETT armoured personnel carriers, 63 Panhard AML-90 and AML-60 armoured cars, a small number of Panhard M3 armoured personnel carriers, 32 Ferret scout cars, 100 M113 armoured personnel carriers (including some with TOW), nine M557A2 command post vehicles, 86 Chaimite armoured personnel carriers (built in Portugal), 24 139.7-mm (5.5-in) towed guns, 36 105-mm M101A1 towed howitzers, 12 155-mm (6.1-in) M109A2 self-propelled howitzers, and about 40 coastal artillery weapons of various calibres.

Much of the new equipment (especially the M113A2 armoured personnel carriers, M109A2 self-propelled howitzers, TOWs, trucks and Jeeps) has been supplied since 1977 by the USA under the Military Aid Programme (MAP).

Infantry weapons include 9-mm Walther P1 pistols, 9-mm FMBP63 sub-machine guns, 7.62-mm (0.3-in) G3 rifles, 7.62-mm HK 21, 7.62-mm MG42/59 and 12.7-mm (0.5-in) M2 HB Browning machine guns, locally built 60-mm (2.36-in) and 81-mm (3.2-in) FBP mortars, French 120-mm (4.72-in) Brandt mortars, 88.9-mm (3.5-in) rocket-launchers, 75-mm (2.95-in) M20 and 106-mm (4.17-in) M40 recoilless rifles, SS.11 ATGWs mounted on locally produced 4×4 Jeeps, and Hughes TOW ATGWs.

Below: The training ship Sagres *was commissioned in the Portuguese navy in 1972. First commissioned in 1938 as a training ship of the German navy, it was taken by the USA in 1945 only to be sold to Brazil in 1948, where it served until its sale to Portugal.*

For some years Portugal has been virtually self-sufficient in infantry weapons at least, with INDEP (Industrias Nacionais de Defesa EP) manufacturing the West German Heckler & Koch G3 rifle under licence, as well as a complete range of 60-mm (2.3-in) and 81-mm (3.1-in) mortars and their associated ammunition. Small arms ammunition and 105-mm artillery ammunition are also manufactured in Portugal, as are 4×4 light vehicles, while Bravia manu-

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factures a complete range of 4×4 and 6×6 trucks as well as the Chaimite 4×4 amphibious armoured personnel carrier, of which 400 have been built for the home and export markets, and the Commando 4×4 internal security vehicle.

Air-defence weapons include less than 20 British Short Blowpipe SAM launchers, 18 West German Rheinmetall twin 20-mm Rh202 cannon and 20 old Bofors 40-mm (1.5-in) L 60 anti-aircraft guns.

The navy

This has a total strength of 15,000 officers and men including marines, of whom about 4,000 are conscripts. The main naval bases are at Faro and Lisbon (Alfeite), and warships include three French-built 'Daphné' class submarines commissioned between 1967 and 1969, four 'Comandante Joao Belo' class frigates built in France and commissioned between 1967 and 1969, three 'Almirante Pereira de Silva' class frigates built in Portugal and commissioned between 1966 and 1968 (these are based on the American 'Dealey' class escorts and two are being converted for offshore patrol duties), four 'Baptista de Andrade' class frigates built in Spain and commissioned in 1974-5 (these have provision for the French Exocet MM.38 surface-to-surface missile, but such have not been fitted), six 'Joao Coutinho' class frigates commissioned in 1970-1 (three built in Spain and three built in West Germany), 10 'Cacine' class large patrol class built in Portugal and commissioned in 1969-73, two 'Dom Aleixo' class large coastal patrol craft commissioned in 1967, three Cheverton patrol craft of GRP which operate at the mouth of the River Tagus, 14 Portuguese-built 'Albatroz' class coastal patrol craft, and four Portuguese-built 'Sao Roque' class coastal minesweepers which are similar to the British 'Ton' class. Support craft include one landing craft tank, two 'Bombarda' class landing craft tank, 10 landing craft mechanized and one landing craft assault. There are also tugs, survey ships, tankers and harbour launches.

The marines total 2,500 officers and men, including 1,000 conscripts, and are organized into three battalions plus supporting units. Equipment includes Chaimite 4×4 amphibious armoured personnel carriers and mortars.

Many of the warships of the Portuguese navy are urgently in need of modernization (including new sensors and weapons). In recent years there have been talks of Portugal purchasing one of the Dutch 'Kortenaer' class frigates, with a further two to be built under licence. But as with a number of other such projects, sufficient funds for this proposal have yet to be found.

The air force

This has a total strength of 9,500 officers and men including the parachute group of 1,800; of this total 3,500 are conscripts.

There are three fighter/ground-attack squadrons, one with 20 Vought A-7Ps, one with 20 Aeritalia G91R/3s and eight G91T/3s, and one with 20 G91R/4s and two G91T/3s. There is a single reconnaissance squadron with four Spanish CASA C-212B aircraft, and an operational conversion unit with 12 Northrop T-38s. Troop transport is provided by one squadron with five Lockheed C-130H Hercules and one squadron with 12 C-212s. Search and rescue cover is provided by three squadrons, one with six C-212s and two with a total of 12 Aérospatiale SA 330 Puma helicopters. There are also two helicopter squadrons with a total of 37 Aérospatiale Alouette IIIs. A total of 32 Reims-Cessna FTB337Gs is used by two liaison squadrons. There are also three training squadrons, one with 30 de Havilland Chipmunks, one with 24 Cessna T-37Cs and one with two C-212As and three Alouette II helicopters.

The Portuguese air force has begun to receive more modern equipment in the last few years, including 20 refurbished Vought A-7P Corsair II attack aircraft. The A-7 can carry up to 6804 kg (15,000 lb) of ordnance.

Equipment on order or being delivered to the air force includes 12 Italian Agusta A 109A helicopters of which four will be fitted with the TOW ATGW system, three Lockheed C-130 Hercules transports and a further 30 refurbished Vought A-7 attack aircraft.

The parachute group consists of one battalion and two companies.

The Portuguese air force has started to receive more modern equipment in recent years, especially with the acquisition from the USA of the refurbished Vought A-7 single-seat attack aircraft. The whole air-defence system is in need of modernization, and surface-to-air missiles and anti-aircraft guns are needed to protect the airfields.

Reserves and paramilitary forces

Reserves for all three arms total 170,000 officers and men. Paramilitary forces include 14,600 in the National Republican Guard whose equipment includes the Bravia Commando Mk III 4×4 internal security vehicle, 15,000 in the public security police and 7,000 in the Fiscal Guard.

The rate of modernization of the Portuguese armed forces depends on a number of key factors. These include a steady growth in the economy, which has failed to happen in recent years, and a lowering of inflation which reached 38 per cent in 1983. NATO is helping with deliveries of more modern equipment, especially to the army and air force, but massive deliveries are needed if the Portuguese armed forces are to be completely re-equipped.

For many years the USA has made extensive use of Lages airfield in the Azores, and this played a key role in the resupply of Israel in the 1973 conflict. It would also be most useful to the recently established Central Command.

A group of left-wing officers staged a successful coup d'etat in April 1974 and succeeded in ending the 40-year dictatorship of Salazar. The following year the communists made a bid for power but democratic elections took place in 1976 and since then Portugal has moved more to the right and become more stable.

João Coutinho *is the nameship of a six-strong class of frigates, of which three were built in West Germany and three in Spain. Displacing 1,380 tons at full load and capable of up to 24.5 kts, whether they will receive much-needed modernization remains uncertain.*